REPORT for 2006

New Brunswick Air Quality Monitoring Results

Environmental Reporting Series

New Nouveau Brunswick

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EXECUTIVE SUMMARY

This report summarises air quality monitoring data in New Brunswick for 2006. The report is intended to provide a convenient summary of air quality results for general public information, with emphasis on air quality assessment in relation to existing air quality standards and objectives. Long-term trend data are also presented for representative sites.

Air quality has been monitored in New Brunswick since the 1960s, when several short-term studies were carried out in Saint John. The emphasis on air monitoring has steadily increased over the years. Air contaminants presently covered by provincial objectives were measured at 59 sites in 12 regional monitoring networks across the province during 2006. Acid rain was measured at 13 additional sites. Volatile organic compounds and mercury in air were also monitored at some locations.

This report presents summary statistics from all monitoring sites in the province, with additional statistical data (in chart form) in an Appendix. Details are also provided in the report on the quality assurance procedures used in the provincial air quality system.

During 2006, there were no exceedances of New Brunswick air quality objectives for nitrogen dioxide or carbon monoxide at any of the provincial monitoring sites. In 2006, exceedances of the 1-h standard for sulphur dioxide were lower in Saint John and Grand Lake than in 2005, and very infrequent in other networks. Ozone exceedances occurred on two days for a total of three hours, only affecting the Fundy Park site. Measurement of ground level ozone in Bathurst began in May 2006. The Campobello Island site operated by the state of Maine was closed at the end of the 2005 season. A few elevated values of total reduced sulphur occurred in Saint John. Total reduced sulfur values showed improvement in the Miramichi area compared to 2005. As for fine particulate matter, there were a total of three days when the daily average value of 30 micrograms per cubic metre was exceeded (one in Miramichi and two in Edmunston). All sites were below the Canada-wide Standard. Total volatile organic compounds concentrations in 2006 were lower at both Forest Hills and Champlain Heights, compared with 2005.

An examination of air quality trends at sites with long records indicates that since the late 1970s and 1980s, air quality has improved for all pollutants currently being measured, with the possible exception of ground level ozone, for which no clear trend is apparent. Annual average levels of sulphur dioxide and total suspended particulate have decreased significantly over the past 15-20 years. The long term levels of carbon monoxide and nitrogen dioxide have also decreased.

Although acid deposition has generally declined since the early 1990s, its effects continue to be of concern in the province, particularly in south-western districts. Sulphate in precipitation, a key indicator of acid rain, was moderately higher in 2006 compared to 2005. However, there has been little change in overall sulfate levels during the past decade.

During 2006, the mobile air quality monitoring vehicle was sited in Saint John, for most of the year, to investigate air quality in an area that is not represented by the existing monitoring network. The data shows no exceedances of standards for total reduced sulfur and nitrogen dioxide whereas there was one exceedance for sulfur dioxide in February.

Feedback

We are interested in your opinions and feedback on this report. All suggestions will be considered, and if possible, incorporated in future reports. You may contact the Sciences and Reporting Branch at (506) 444-2644, by fax at (506) 453-2265 or e-mail Randy Piercey at Randy.Piercey@gnb.ca with any comments.

Acknowledgements

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1. INTRODUCTION

This report summarises air quality information gathered during 2006 at monitoring locations across New Brunswick. A summary of data from the provincial acid precipitation network is also included. The report focuses on ambient (i.e. outdoor) air, which provides an indication of environmental quality in terms of air pollution.

Air quality objectives used in New Brunswick are listed on the following page. Additional information on air quality standards and objectives, sources and effects of air pollutants, and climate change and air quality may be found on the Department of the Environment (DENV) web site at:

http://www.gnb.ca/0009/0010-e.asp

2. MONITORING NETWORKS

Compliance with air quality objectives or regulatory standards is determined by monitoring, for the most part on a continuous basis.

Monitoring locations are selected so that they will provide information which is representative of the surrounding area. In cases where there is a known pollutant source, monitors are often distributed around it in locations where the impact is expected to be greatest. Such locations are typically selected based on the results of computer dispersion models. These are computer programs which simulate the behaviour of plumes, or discharge streams of gases as they are released from smokestacks. Such models take into account the complete variety of weather conditions which may be experienced in the area where the stack is located, as well as the nature of the local landscape.

In New Brunswick, large industrial emission sources, such as electricity generating stations or pulp mills, are legally required by the Department of the Environment (DENV) to carry out ambient air quality monitoring as prescribed in their Approvals to Operate under the Clean Air Act. Such Approval conditions also detail the required equipment specifications, locations and reporting frequency. In such cases, the monitoring equipment and maintenance procedures are checked periodically by DENV staff or independent auditors, to ensure the required standards for operation and technical accuracy are being met.

In the case of air pollutants which are transported long distances, and which may be found in rural, as well as urban areas, DENV establishes and operates its own monitoring sites. The Department also maintains sites in areas where there are multiple large industrial emission sources, such as Greater Saint John.

Additionally, there are 13 provincial acid precipitation monitoring site augmented by one federally-operated site in New Brunswick (at Harcourt, in eastern New Brunswick).

Federal support is also provided for the operation of several other air quality monitoring sites across the province (through the National Air Pollution Surveillance (NAPS) program).

The location of air quality monitoring sites and the main regional and local networks are shown in Figure 1. More detail on the exact location of each site is provided in the following sections.

The major industry and urban networks are identified. Filled circles on the map indicate rural ozone sites. The remainder indicate ambient monitoring locations for other substances including sulphur dioxide, nitrogen dioxide and particulates.

In the following table are listed New Brunswick Air Quality Objectives for 5 air pollutants: carbon monoxide, hydrogen sulphide, nitrogen dioxide, sulphur dioxide and total suspended particulate. These Objectives are established under the Clean Air Act that includes a provision for required annual reporting to the Legislative Assembly on achievement of air quality objectives.

New Brunswick Air Quality Objectives				
Pollutant	Averaging period			
	1 hour	8 hour	24 hour	1 year
Carbon monoxide	30 ppm	13 ppm		
Hydrogen Sulphide	11 ppb		3.5 ppb	
Nitrogen dioxide	210 ppb		105 ppb	52 ppb
Sulphur dioxide*	339 ppb		113 ppb	23 ppb
Total suspended particulate			120 micrograms/m^3	70 micrograms/m^3

* The standards for sulfur dioxide are 50% lower in Saint John, Charlotte, and Kings counties.

As there is no New Brunswick Air Quality Objective for ozone, the National Objectives for ozone are included below.

Elsewhere in the report, reference is made to other air quality standards or objectives from other jurisdictions (provincial, national or international) to aid in the interpretation of air quality conditions in New Brunswick.

National Ambient Air Quality Objectives for Ozone (ppb)			
Averaging period	Desirable Level	Acceptable Level	Tolerable Level
1 Hour	51	82	153
24 hours	15	25	-
Annual	-	15	-

3. AIR QUALITY MONITORING RESULTS FOR 2006

Results are presented for each monitoring network in the Province. The locations of the monitoring sites are shown on regional scale maps. The numeric results are shown in tables, and further details in chart form appear in Appendix I. Explanatory notes are provided on each network, and a discussion of the results for each network is included.

A. SAINT JOHN

The Saint John area has the longest history of air quality monitoring in New Brunswick, beginning in 1961. Since that time, air quality has been monitored at more than 30 different locations in the city and surrounding area. A total of 16 air quality monitoring sites, which were active in 2006, are shown in Figures 2 and 3. Figure 3 shows four new sites reported for the first time in 2005, established in connection with the Coleson Cove generating station.

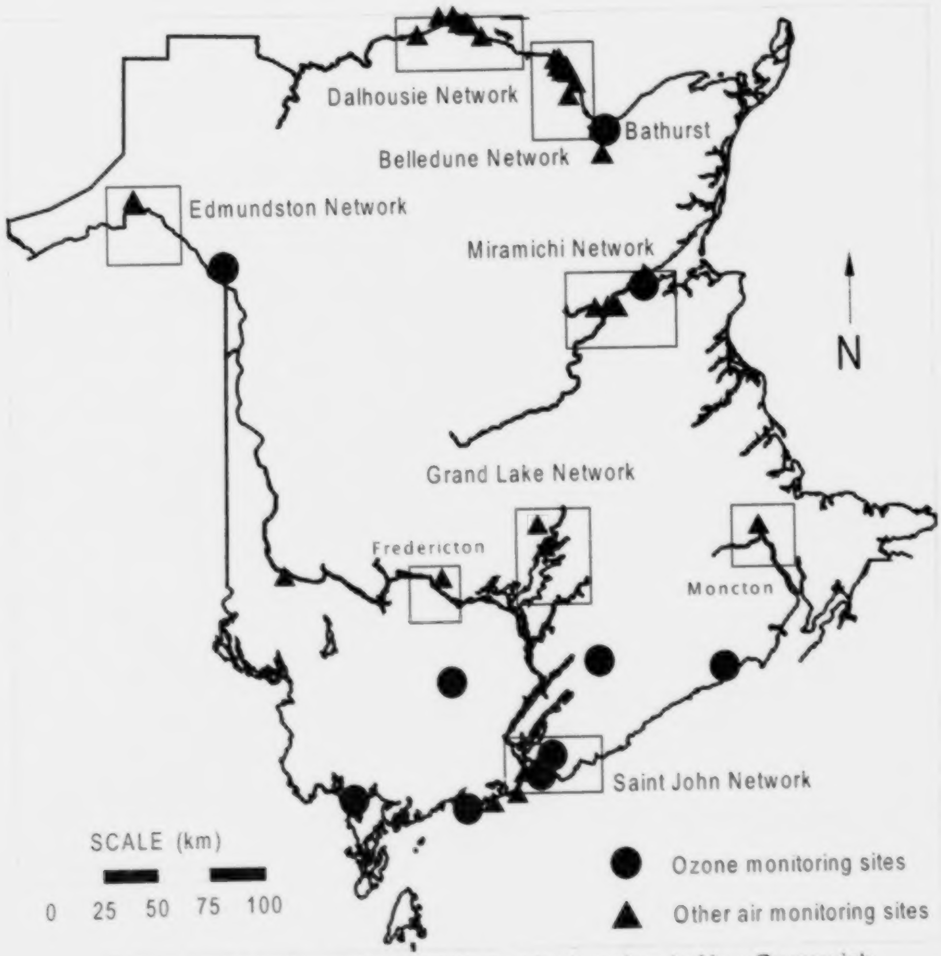


Figure 1. Locations of air quality monitoring sites in New Brunswick, 2006.

Most of these sites are electronically linked to a central computer at the DENV central office in Fredericton. The system communicates with the monitors a minimum of once each hour and obtains the latest readings. The readings are then added to the existing data archive and some are used to prepare IQUA (Index of the Quality of the Air) public information messages, as well as to determine the nature of any abatement actions required by industries if concentrations rise above pre-determined trigger values. Such episode control systems are specified in various Approvals to Operate issued to major emission sources by the Department.

On the City's west side, three monitoring sites for total reduced sulphur are operated by Irving Pulp and Paper Ltd. DENV also operates a site at the Hillcrest Baptist Church off Lancaster Avenue, at which sulphur dioxide, total reduced sulphur, ozone and particulate matter are monitored. In east Saint John, four sites for sulphur dioxide and one for $PM_{2.5}$ are operated by Irving Oil Ltd., as required by the company's operating approval, and results are sent electronically to the Department's data system.

To the west, outside the city, NB Power maintains sites at Grand Bay-Westfield (SO_2), Musquash (SO_2), Manawagonish Road (SO_2 and $PM_{2.5}$) and Lorneville (SO_2 and $PM_{2.5}$). These sites were established in late 2004 and reported for the first full year in 2005.

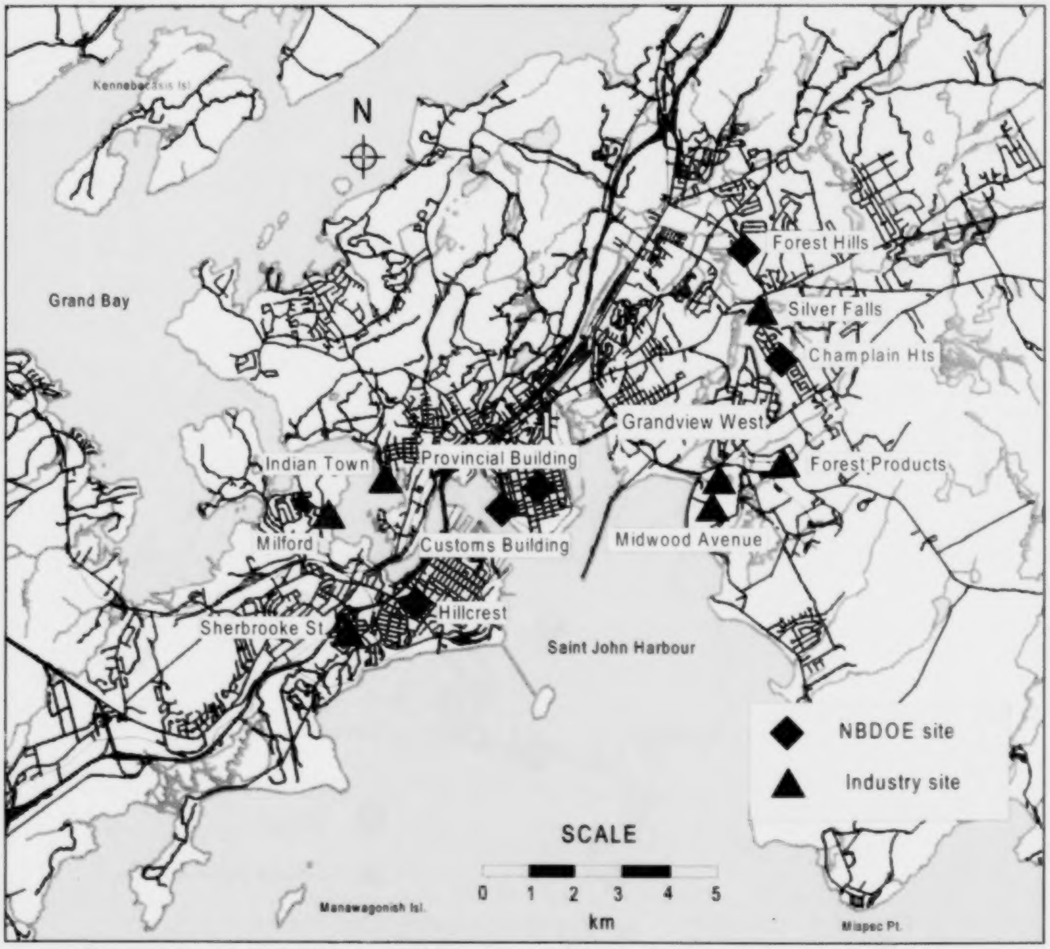


Figure 2. Air quality monitoring sites in Saint John, New Brunswick, 2006.

DENV also maintains sites at Forest Hills and Champlain Heights in the eastern suburbs, and at the Customs Building in the uptown area. The Customs site has monitors for ozone, sulphur dioxide, nitrogen dioxide and carbon monoxide. At Forest Hills there are monitors for ozone, sulphur dioxide, nitrogen oxides, $PM_{2.5}$ and volatile organic compounds (VOCs). At the Champlain Heights School, sulphur dioxide, total reduced sulphur, nitrogen dioxide, VOCs and $PM_{2.5}$ are measured.

A.1 Carbon Monoxide

This pollutant is monitored at the Customs Building site to provide data representative of the city centre. Peak hourly values in every month seldom exceeded 2.0 ppm, and thus were well below the applicable objective of 30 ppm. There were no exceedances of the 8-h objective of 13 ppm.

A.2 Nitrogen Dioxide

There were no exceedances of the 1-hour objective of 210 ppb at any sites (Forest Hills, Customs Building or Champlain Heights School or Grandview West 2) in 2006. Neither were the 24-hour objective (105 ppb) or the annual objective (52 ppb) exceeded. At the Customs site, average concentrations were similar to those seen in 2005; however peak values reached higher levels in February and March. At Forest Hills, levels were similar to those in 2005. Champlain Heights generally had values similar to or slightly higher than those seen at Forest Hills site.

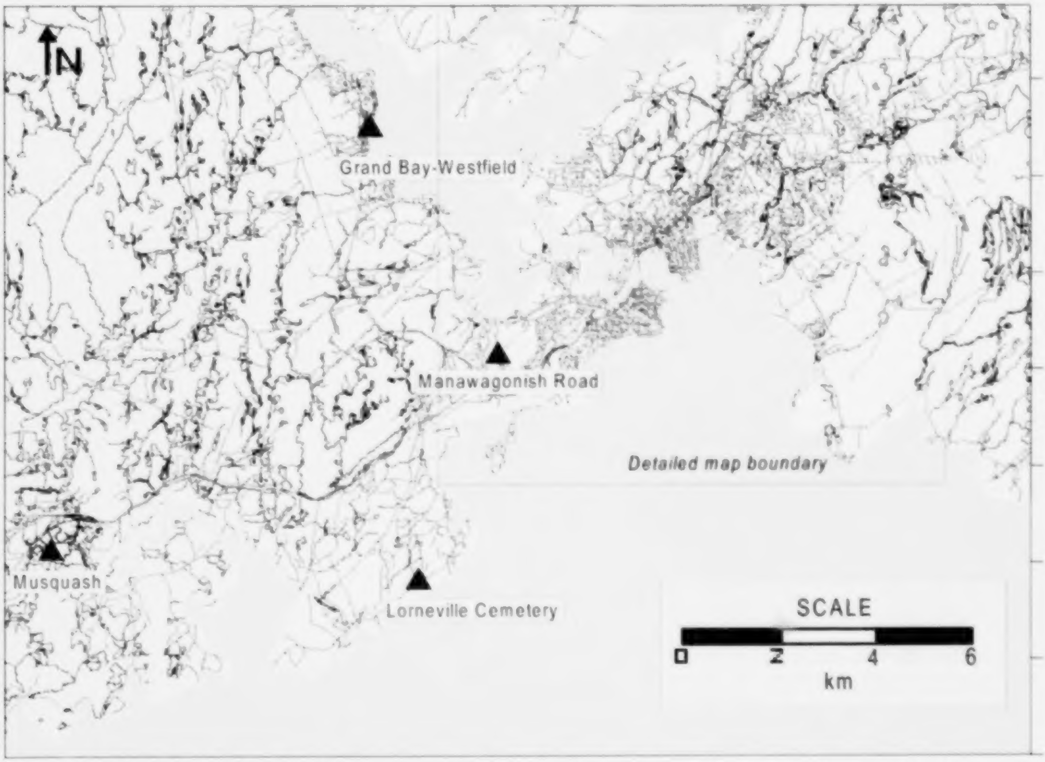


Figure 3. Locations of NB Power Coleson Cove network air quality monitoring sites in New Brunswick, 2006.

A.3 Sulphur Dioxide

Exceedances for sulphur dioxide are summarised in Table 1. During 2006, the number of exceedances was similar to or lower than 2005. Most of the exceedances occurred at the Grandview West site. However, unlike 2005, the annual average (7 ppb) did not exceed the objective (11 ppb) at Grandview West during 2006. In 2006, 19 exceedances of the 24-hour objective occurred at the Midwood site over one 24-hour period in April. In the Coleson Cove Network, there were no exceedances.

A.3.1 Sulphur Dioxide Episode Control

An episode control program is in place to prevent ambient sulphur dioxide reaching undesirably high levels in Saint John. Control actions are initiated by major industries in the city in response to measurements made at the fixed monitoring sites.

As noted earlier, these control actions are made mandatory by being incorporated into the relevant Approvals to Operate issued by DENV. The episode control plans themselves are subject to continual review. DENV meets regularly with staff of the major industries in the city to review compliance in respect of sulphur dioxide.

All exceedance events are examined in detail and any shortfalls in the nature and extent of response action are addressed. DENV staff sometimes request emission control actions separate from or in addition to those specified in the episode control plans. Such action may be warranted due to unusual conditions, such as poor dispersion, or during periods when smog advisories are in effect.

Some of the ways in which industries respond to rising levels of sulphur dioxide include switching to lower or near-zero sulphur fuels, and reducing production rates or electricity generating rate. Response action is initiated when concentrations reach 80 ppb, approximately half the 1-hour objective of 170 parts per billion.

Table 1. Exceedances of provincial objectives for SO_2 in Saint John, 1997-2006.

	Midwood Avenue	Champlain Hts	Customs Building	Forest Hills	Forest Products	Hillcrest	Grandview West 1	Silver Falls
1 HOUR OBJECTIVE								
2006	2	1	0	0	0	0	61	0
2005	0	3	0	1	0	0	135	4
2004		0	2	0	0	0	153	2
2003		1	0	1	2	0	153	10
2002		0	0	0	0	0		0
2001		1	0	0	0	0		4
2000		4	3	1	1	2		3
1999		0	0	2	4	0		0
1998		4	3	4	11	0		1
1997		0	0	4	33	9		3
24-HOUR OBJECTIVE								
2006	19	0	0	0	0	0	255	0
2005	0	0	0	0	0	0	331	16
2004		0	0	0	0	0	504	31
2003		47	0	23	3	0	429	117
2002		0	0	0	0	23		14
2001		4	0	0	0	0		47
2000		35	0	0	0	0		0
1999		0	0	25	25	0		0
1998		26	31	9	119	0		0
1997		47	0	7	216	59		52

A.4 Particulate matter

A.4.1 PM_{10} High Volume Sampler

DENV operated a PM_{10} high volume sampler at the Provincial Building site until October 2006 when the site was closed. A new monitoring site for continuous measurement of $PM_{2.5}$ will be established in the uptown area of Saint John in 2007.

Monitoring results at the Provincial Building were low during 2006, with no exceedances of the California/GVRD 24-hour standard of 50 micrograms per cubic meter.

A.4.2 $PM_{2.5}$

Forest Hills - TEOM

The Canada-wide Standard for $PM_{2.5}$ is 30 micrograms per cubic metre (μg/m^3) based on a daily 24-hour average. In 2006, there were no days having a daily average exceeding 30 μg/m^3.

Forest Hills - BAM

There were no days where the daily average exceeded 30 μg/m^3 during 2006. However, there were 16 hours having a running 24-h average exceeding 30 μg/m^3. Many of these exceedances occured in early July, at a time when elevated $PM_{2.5}$ levels were recorded at other monitoring sites, which is indicative of a regional haze event. Summary statistics are shown in Table 2.

Champlain Heights - BAM

Results are summarised in Table 2. There were no days during the year having a daily average exceeding the 24-h Canada-wide Standard of 30 μg/m^3.

TEOM and BAM

Continuous monitoring of paticulate matter is routinely carried out using two principal methods of measurement referred to as TEOM and BAM.

TEOM stands for tapered element oscillating microbalance. The methods senses the change in mass of a filter, mounted on a vibrating quartz rod (the tapered element).

BAM stands for beta attenuation method. This method directs a beam of beta radiation at a paper filter tape through which the air sample is drawn. The amount of weakening or scattering of the beam can be related to the particle mass on the tape.

Although both methods provide useful results, they may not be directly comparable. Detailed intercomparison of continuous particulate measurement methods is ongoing in Canada, the US and around the world.

Coleson Cove Network - BAM

During 2006, there were no days having a daily average exceeding 30 μg/m^3 at both Lorneville Cemetery and Manawagonish Road sites (Appendix I). However, there were 16 hours having a running 24-h average exceeding 30 μg/m^3 at Lorneville Cemetery and 3 hours at Manawagonish Road. See note to Forest Hills (BAM).

A.5 Ground Level Ozone

Ozone was monitored at three sites in the city during 2006: Forest Hills, Customs Building and in west Saint John at Hillcrest Church. During 2006, there were no exceedances of the 1-hour National Ambient Air Quality Objective for ozone of 82 ppb in the Saint John Network. Statistics were also calculated in reference to the Canada-wide Standard for ozone, which is based on a maximum daily 8-hour average, and is set at 65 ppb. No exceedances of the Canada-wide Standards were recorded in 2006.

Further details on ground level ozone follow in section 8, where additional results for all ozone monitoring sites are summarised.

Table 2. Monitoring results for $PM_{2.5}$, Saint John Network, 2006.

	Forest Hills (TEOM)	Forest Hills (BAM)	Hillcrest (BAM)	Champlain Hts (BAM)	Lorneville (BAM) *	Manawagonish Rd. (BAM) *
Annual average (micrograms per cubic metre)	3.9	6.3	8.7	6.8	6.9	7.2
98^{th} percentile value (Canada wide standard statistic)	13.3	20.7	23.4	14.7	21.3	19.9
Daily average >30 micrograms/ cubic metre	0	0	0	0	0	0
Hours with running 24-h average >30	0	16	0	0	16	3

* Coleson Cove Network

A.6 Total Reduced Sulphur

Total reduced sulphur is monitored at Champlain Heights by Department of the Environment as well as three sites operated by Irving Pulp and Paper (Milford, Indian Town and Sherbrooke St.).

During 2006, there were a few exceedances of objectives at Champlain Heights in October and December, and none elsewhere. Note: for evaluation of TRS data, and in the absence of a specific objective for TRS, reference is made to the provincial objectives for hydrogen sulphide. Results since 1997 are summarised in Table 3.

Table 3. Exceedances of provincial objectives for TRS in Saint John, 1997-2006.

		Champlain Hts	Hillcrest	Indian Town	Milford	Sherbrooke St.
2006	1-h	7	M	0	0	0
2005	1-h	2	0	0	3	0
2004	1-h	3	M	0	0	0
2003	1-h	0	0	0	0	1
2002	1-h		0	2	0	0
2001	1-h		0	0	1	9
2000	1-h		3	2	0	4
1999	1-h		1	6	0	0
1998	1-h		17	29	23	16
1997	1-h		31	10	22	0
2006	24-h	21	0	0	0	0
2005	24-h	0	0	0	22	0
2004	24-h	0	M	0	19	0
2003	24-h	0	0	0	0	0
2002	24-h		0	11	0	0
2001	24-h		0	0	5	684
2000	24-h		18	47	12	29
1999	24-h		20	26	0	0
1998	24-h		258	277	136	157
1997	24-h		282	89	234	0

M = missing data

A.7 Volatile Organic Compounds (VOCs)

VOCs have been measured at Forest Hills in east Saint John since 1992. Measurements have also been made for the same period of time at Point Lepreau, approximately 40 km southwest of the city. The Lepreau site is predominantly upwind of Saint John and serves as a control or reference site, representative of rural southern New Brunswick. In July 2000, VOC sampling was begun at Champlain Heights in east Saint John. The monitoring program for VOCs is a collaborative one between DENV and Environment Canada. DENV staff maintain the monitoring sites and set up the equipment to take samples (normally every 6 days). Environment Canada performs the analyses on the collected air samples.

Sites in Saint John collect one 24-hour sample every 6 days and the rural site at Point Lepreau collects a 4-hour sample beginning at noon, every 3 days. All samples are analysed for over 150 compounds, which include VOCs which are involved in the formation of ozone, as well as VOCs which may be of interest for other reasons. For example, they may be indicators of various kinds of industrial activity, or they may be potentially of concern in their own right (for example, substances which are known to be carcinogenic, such as benzene). Some other VOCs which are measured are found at similar concentrations regionally or even globally (such as several CFC compounds). These substances are of key interest in atmospheric research.

There are no national ambient air quality standards for VOCs in Canada. Results can be compared against guidelines published by other agencies, and examined over time to look for trends, as well as differences between sites.

Table 4 lists results for 2006 for selected VOCs, compared with guidelines recommended by various agencies. This subset of VOCs contains compounds which have traditionally been classified as "air toxics", and which are considered potentially harmful to human health. The first line of the results table also shows the average concentration taking into account all VOCs measured at each site (total VOC).

Levels of VOCs measured at Champlain Heights are typically higher than at Forest Hills, and this was true for 2006. Both sites had higher concentrations of most VOCs than the Point Lepreau site.

For the selected VOCs for which guidelines could be referenced, concentrations at both monitoring sites were found to be below these targets at both sites, in most cases by a substantial margin. The annual guideline for benzene published in the United Kingdom (5 ppb) has a long-term target of 1 ppb (EPAQS, 1994; HMSO, 2000). The Swedish guideline is 1.5 ppb with a compliance date of 2010 (Swedish EPA, 2003). Benzene is emitted from motor vehicles and is a component of gasoline. In Saint John, the petroleum refinery and other industries would also contribute to ambient concentrations. Additional analysis of VOC data is included in section 8.

Table 4. Monitoring results for Volatile Organic Carbon, 2006.

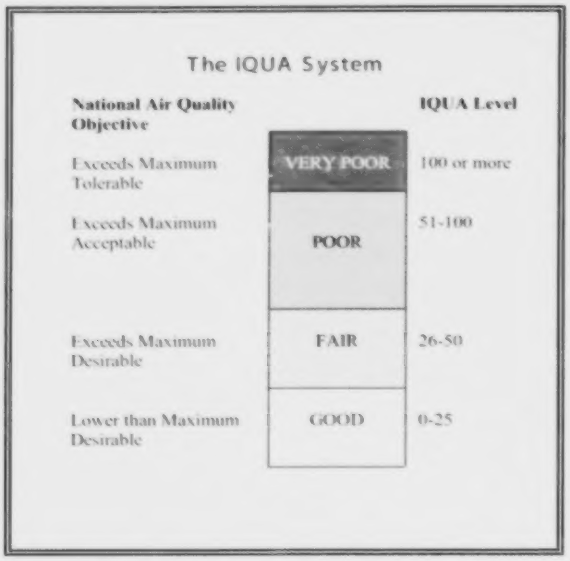
VOC	Max 24-h averages (ppb)		24-h guidelines (ppb)	Annual averages (ppb)			Annual Guidelines (ppb)
	Forest Hills	Champlain Hts		Forest Hills	Champlain Hts	#Point Lepreau	
Total VOC	83.0	209.3		30.4	66.4	6.23	
1,3 butadiene	0.09	0.22		0.03	0.03	0.00	1 (UK)
Benzene	1.18	1.92		0.26	0.59	0.06	5 (UK) 1.5 (Sweden)
Toluene	1.58	4.70	63* (WHO) 106 (AB) 524 (ON)	0.37	1.30	0.07	10-100 (Sweden)
Ethylbenzene	0.25	0.89	4464* (WHO) 227 (ON)	0.06	0.24	0.01	
Xylenes	0.74	2.32	1013 (WHO) 161 (AB) 166 (ON)	0.16	0.63	0.02	
Styrene	0.03	0.03	56* (WHO) 94 (MB) 93 (ON)	0.01	0.01	0.01	
Chloromethane	0.72	0.67	3344 (ON)	0.55	0.53	0.55	
Vinyl chloride	0.00	0.00	0.4 (ON)	0.00	0.00	0.00	
1,1 dichloroethylene	0.00	0.00		0.00	0.00	--	
Dichloromethane	0.31	0.35	792 (WHO) 62 (ON)	0.06	0.06	0.60	100-250 (Sweden)
1,2 dichloroethane	0.02	0.03	159 (WHO)	0.01	0.01	0.01	100-150 (Sweden)
Carbon tetrachloride	0.11	0.11	0.4 (ON)	0.09	0.09	0.09	
1,2 dichloropropane	0.01	0.00		0.00	0.00	--	
Trichloroethylene	0.01	0.01	202 (ON)	0.00	0.00	0.00	100-200 (Sweden)
1,1,2 trichloroethane	0.00	0.00		0.00	0.00	0.00	
Ethylene dibromide	0.00	0.00	0.4 (ON)	0.00	0.00	--	
Tetrachloroethylene	0.10	0.04	34 (WHO)	0.01	0.00	0.01	
1,1,2,2 tetrachloroethane	0.00	0.00		0.00	0.00	--	
Formaldehyde	2.17	11.27	52 (ON)	0.65	1.88	--	
Acetaldehyde	1.57	2.00	274 (ON)	0.39	0.81	--	
MTBE	3.20	8.88		0.14	0.32	--	

Notes: The guidelines marked with an asterisk (*) are for a weekly period. AB =Alberta; ON = Ontario; MB = Manitoba. Sources: WHO (World Health Organisation): 1987, 1994,1996 & 1997; Swedish standards: OECD, 1995; Swedish EPA, 2003. UK standards: HMSO, 2000. Alberta, Ontario, and Manitoba : Provincial Environment Departments. # Data at Pt Lepreau are collected for 4 hour samples, sampling every third day, starting at noon AST. The other sites are based on 24-h samples every 6th day.

For additional information, see also Table 27 on page 52.

A.8 Index of the Quality of the Air (IQUA)

The IQUA system has been used in Saint John for over 25 years to help make air quality monitoring results easier to understand. Results for each pollutant measurement are expressed on a scale from 1-100, and classed as "good" (index 0 to 25), "fair" (26 to 50), "poor" (51 to 100) or "very poor" (over 100). Each of the categories is based on the National Air Quality Objectives. For example, "good" air quality indicates that pollutants are in the "desirable" range as defined by the air quality objectives. Values in the "fair" range are above the desirable, but below the acceptable objective. IQUA information is available via the DENV web site:



http://www1.gnb.ca/0355/0003/0000.asp

This web page is updated three times per day. IQUA information is also accessible by phone via recorded message (dial 636 4991 in the Saint John area). The recorded message is updated hourly.

For each hour, the IQUA index is computed for each pollutant measured at the site. The value reported is the highest of each of the individual values. For example, if two pollutants are in the "good" range and one is in the "poor" range, then the index for the hour would be reported as "poor". In addition, the pollutant responsible for determining the overall index value is usually identified.

Summary statistics are given in Table 5 for the three designated IQUA sites in Saint John: Customs Building (uptown), Forest Hills (east) and Westside Station (west). Table 5 shows the number of hours logged in each IQUA category. It is apparent that the vast majority of the time, air quality was in the "good" category during 2006 (more than 98% of the time). The percentage of hours in the "fair" range was less than 2% at all sites, and there were no hours recorded in the poor or very poor categories.

Table 5. IQUA Summary for Saint John sites, 2006.

	Good (0-25)	Fair (26-50)	Poor (51-100)	Very Poor (over 100)
Forest Hills	98.5	1.5	0.0	0.0
Customs	99.2	0.8	0.0	0.0
Westside St.	98.8	1.2	0.0	0.0

B. MIRAMICHI

There are three monitoring sub-networks in the Miramichi region, one centred on the UPM pulp mill emission sources, another on NB Power's Millbank gas turbine generating site, and a third operated by the Weyerhaeuser Company.

Pollutants of concern in these networks include hydrogen sulphide and particulates (UPM) plus nitrogen dioxide and sulphur dioxide (Millbank).

Figure 4 shows the locations of the sites in the region.

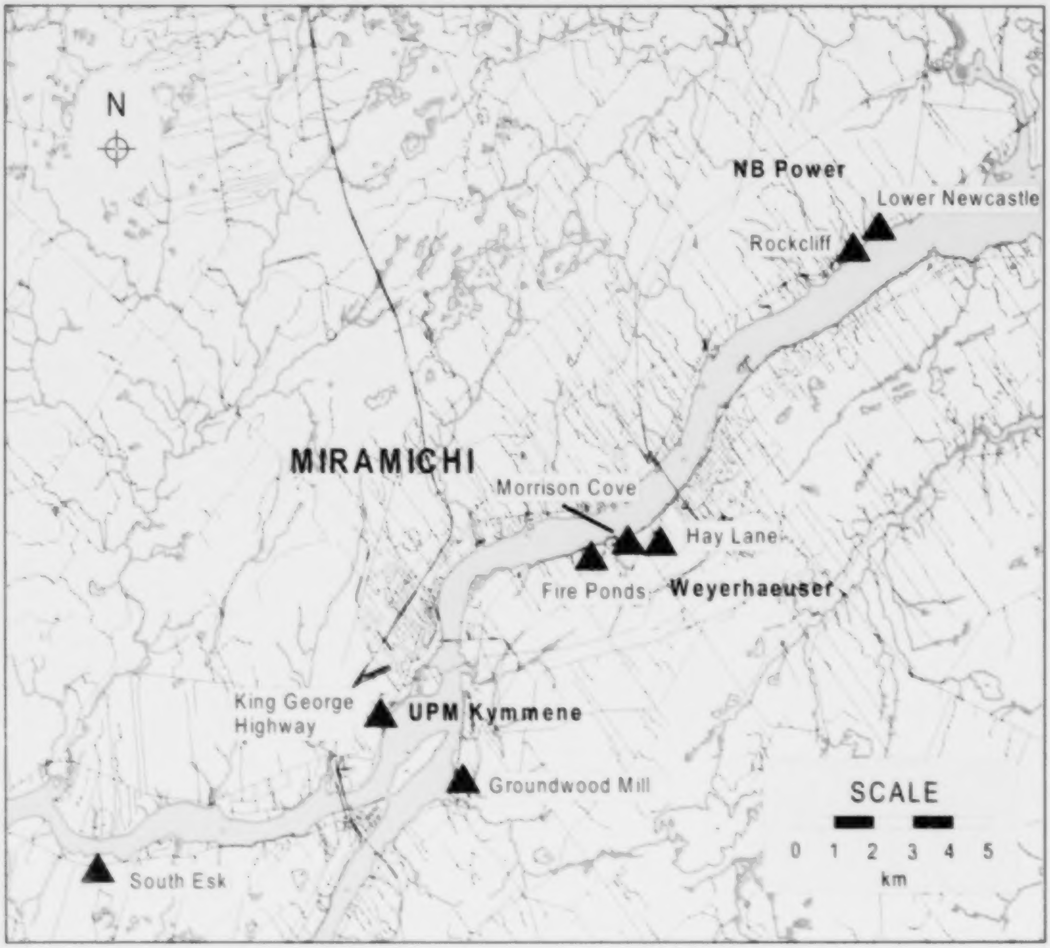


Figure 4. Air quality monitoring sites in the Miramichi Region.

B.1 UPM NETWORK

B.1.1 Total Reduced Sulphur

The compliance summary for 2006 is contained in Table 6, which also shows results for each year since 1997.
Note: for evaluation of TRS data, and in the absence of a specific objective for TRS, reference is made to the provincial objectives for hydrogen sulphide.

The large decrease in the number of exceedances at the King George Highway site in recent years is due to the shut down of the kraft pulp mill in 2004. There were no 1-h exceedances at the Groundwood site during 2006. However, there was an increase in the number of 24-h exceedances at the Groundwood site. The exceedances at the Groundwood site appear to be due to TRS released from tidal flats during periods of low tide.

Table 6. Exceedances of provincial objectives for TRS in Miramichi, 1997-2006.

		Groundwood	King George Hwy
2006	1-h	0	1
2005	1-h	4	3
2004	1-h	0	142
2003	1-h	2	56
2002	1-h	0	23
2001	1-h	1	90
2000	1-h	0	598
1999	1-h	5	488
1998	1-h	9	410
1997	1-h	3	429
2006	24-h	163	23
2005	24-h	0	61
2004	24-h	74	1149
2003	24-h	5	491
2002	24-h	0	232
2001	24-h	4	772
2000	24-h	0	2219
1999	24-h	9	2497
1998	24-h	25	1636
1997	24-h	0	2105

Total Suspended Particulate

There were no exceedances of the TSP standard of 120 micrograms per cubic metre at any of the three stations in the network during 2006. Results since 1997 are shown in Table 7. Detailed results are shown in Appendix I.

B.2 MILLBANK NETWORK

The two sites at Millbank (Rockcliff and Lower Newcastle, see Figure 4) are positioned to assess the impact of NB Power's gas turbine generating station. The pollutants monitored include sulphur dioxide, nitrogen dioxide and TSP (Rockcliff only). Since 1997, there have been no exceedances for SO_2, NO_2 or TSP logged in this network.

B.2.1 Nitrogen dioxide

There were no exceedances of the 1-hour or 24-hour objective at either monitoring site in 2006, and monthly means were all very low. Monthly results for 2006 are shown in Appendix I.

B.2.2 Sulphur dioxide

There were no exceedances of the 1-hour or 24-hour objective at either site in the network. The monthly means were also very low. Monthly results are shown in Appendix I.

B.2.3. Total Suspended Particulate

None of the measurements made at the Rockcliff site exceeded the 24-hour objective of 120 micrograms per cubic metre in 2006, and almost all values were well below the objective. Detailed results are given in Appendix I.

Table 7. Exceedances of standards for TSP, Miramichi, 1997-2006.

		Groundwood	King George Hwy	South Esk
2006	24-h	0	0	0
2005	24-h	0	0	0
2004	24-h	0	0	0
2003	24-h	0	0	0
2002	24-h	0	2	0
2001	24-h	0	0	0
2000	24-h	0	0	0
1999	24-h	0	0	0
1998	24-h	0	0	0
1997	24-h	0	0	0

B.3 WEYERHAEUSER

B.3.1 Total Suspended Particulate

Weyerhaeuser operates a manufacturing plant for oriented strand board, located on the south shore of the Miramichi River. Two sites are maintained by this company for TSP, one at Morrison Cove and one at the Fire Ponds site. The sampling schedule in 2006 was every sixth day.

During 2006, there was one exceedance of the 24-h standard of 120 micrograms per cubic metre at the Fire Ponds site in July (Table 8). The annual objective of 70 micrograms per cubic metre was not exceeded at either site.

B.3.2 $PM_{2.5}$

Fine particulate ($PM_{2.5}$) was measured continuously at two sites: Fire Ponds and Hay Lane (see Figure 4). Monitors at these sites use the beta attenuation (BAM) method. Results are summarised in Table 9.

Both sites exceeded the daily average of 30 micrograms per cubic metre on September 17, 2006, due largely to the influence of forest fires in Ontario affecting the Maritime region (see page 31 on Air Quality Advisory). Data are summarised in detail in Appendix I.

Table 8. Exceedances of provincial objectives for TSP, Weyerhaeuser, Miramichi, 2000-2006.

		Mirview Subdiv.	Morrison Cove	Fire Ponds
2006	24-h		0	1
2005	24-h		0	1
2004	24-h		0	0
2003	24-h	closed	1	2
2002	24-h	1	0	
2001	24-h	0	1	
2000	24-h	0	1	

Table 9. Monitoring results for $PM_{2.5}$, Weyerhaeuser Network, Miramichi, 2006.

	Fire Ponds	**Hay Lane**
Annual average (micrograms per cubic metre)	7.2	5.9
98th percentile value (Canada wide standard statistic)	19.1	17.3
Daily average >30 micrograms/cubic metre	1	1
Hours with running 24-h average >30	2	12

C. GRAND LAKE - NB POWER

Figure 5 shows the locations of the four monitoring sites in this network. These are sited to monitor the effects of the Grand Lake coal-fired electrical generating station and associated activities. The four monitoring sites are operated by NB Power and each measures sulphur dioxide and TSP.

C.1 Sulphur dioxide

In 2006, there was no exceedances of the 1-h standard of 340 parts per billion at any sites. The 24-h standard of 113 ppb was not exceeded at any site. Compliance statistics for SO_2 since 1997 are shown in Table 10.

C.2 Total Suspended Particulate

In 2006, there were no exceedances of the 24-hour standard of 120 micrograms per cubic metre in this network. Complete results are given in Appendix I. Compliance statistics for TSP since 1997 are shown in Table 11.

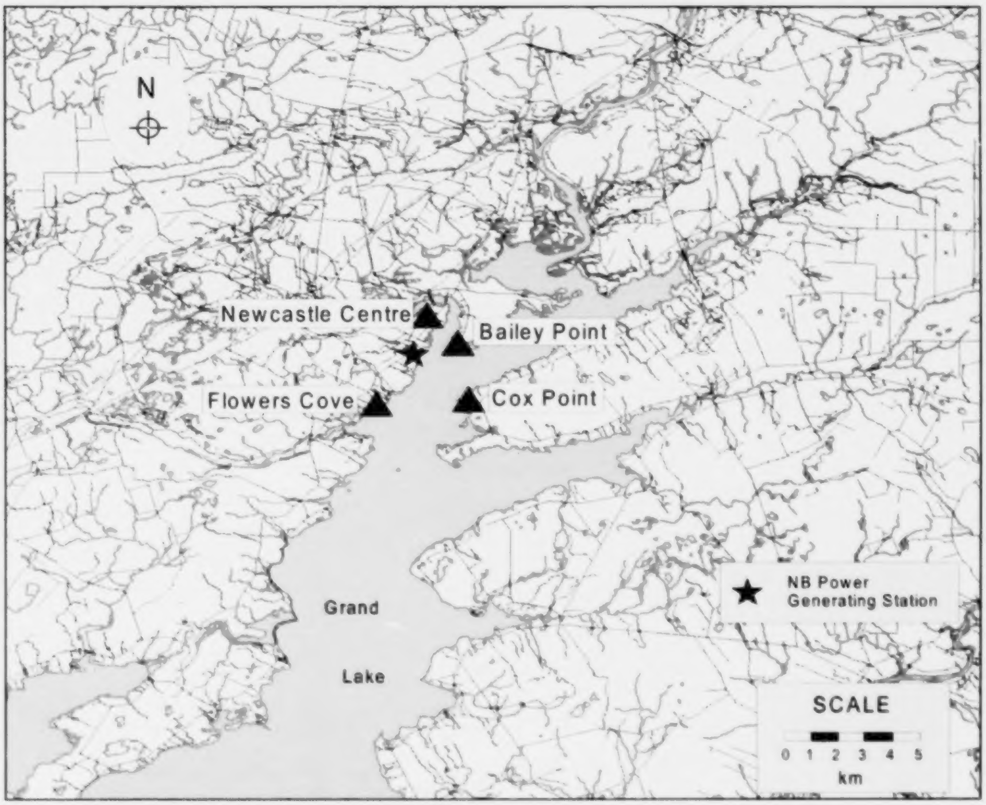


Figure 5. Air quality monitoring sites in the Grand Lake Network.

Table 10. Exceedances of provincial objectives for SO_2, NB Power Grand Lake Network, 1997-2006.

		Bailey Pt.	Cox Pt.	Flowers Cove	Newcastle Centre
2006	1-h	0	0	0	0
2005	1-h	0	0	0	1
2004	1-h	1	0	1	6
2003	1-h	1	0	2	5
2002	1-h	0	0	3	3
2001	1-h	0	2	0	0
2000	1-h	0	0	0	2
1999	1-h	0	0	0	4
1998	1-h	0	1	0	5
1997	1-h	0	0	2	3
2006	24-h	0	0	0	0
2005	24-h	0	0	0	0
2004	24-h	0	0	0	0
2003	24-h	0	0	0	0
2002	24-h	0	0	0	0
2001	24-h	0	0	0	0
2000	24-h	0	0	0	0
1999	24-h	0	0	0	0
1998	24-h	0	0	0	0
1997	24-h	0	0	0	0

Table 11. Exceedances of provincial objectives for TSP, NB Power Grand Lake Network, 1997-2006.

		Bailey Pt.	Cox Pt.	Flowers Cove	Newcastle Centre
2006	24-h	0	0	0	0
2005	24-h	0	0	0	0
2004	24-h	0	0	0	0
2003	24-h	0	0	0	0
2002	24-h	0	0	0	0
2001	24-h	0	0	0	0
2000	24-h	0	0	0	0
1999	24-h	0	0	1	0
1998	24-h	0	0	0	0
1997	24-h	0	0	0	0

D. EDMUNDSTON – FRASER INC.

Figure 6 shows the locations of the monitoring sites, located primarily to monitor the impacts of the Fraser Inc. pulp mill.

D.1 Sulphur Dioxide

There were no exceedances of SO_2 objectives in this network during 2006. Compliance statistics for SO_2 since 1997 are shown in Table 12.

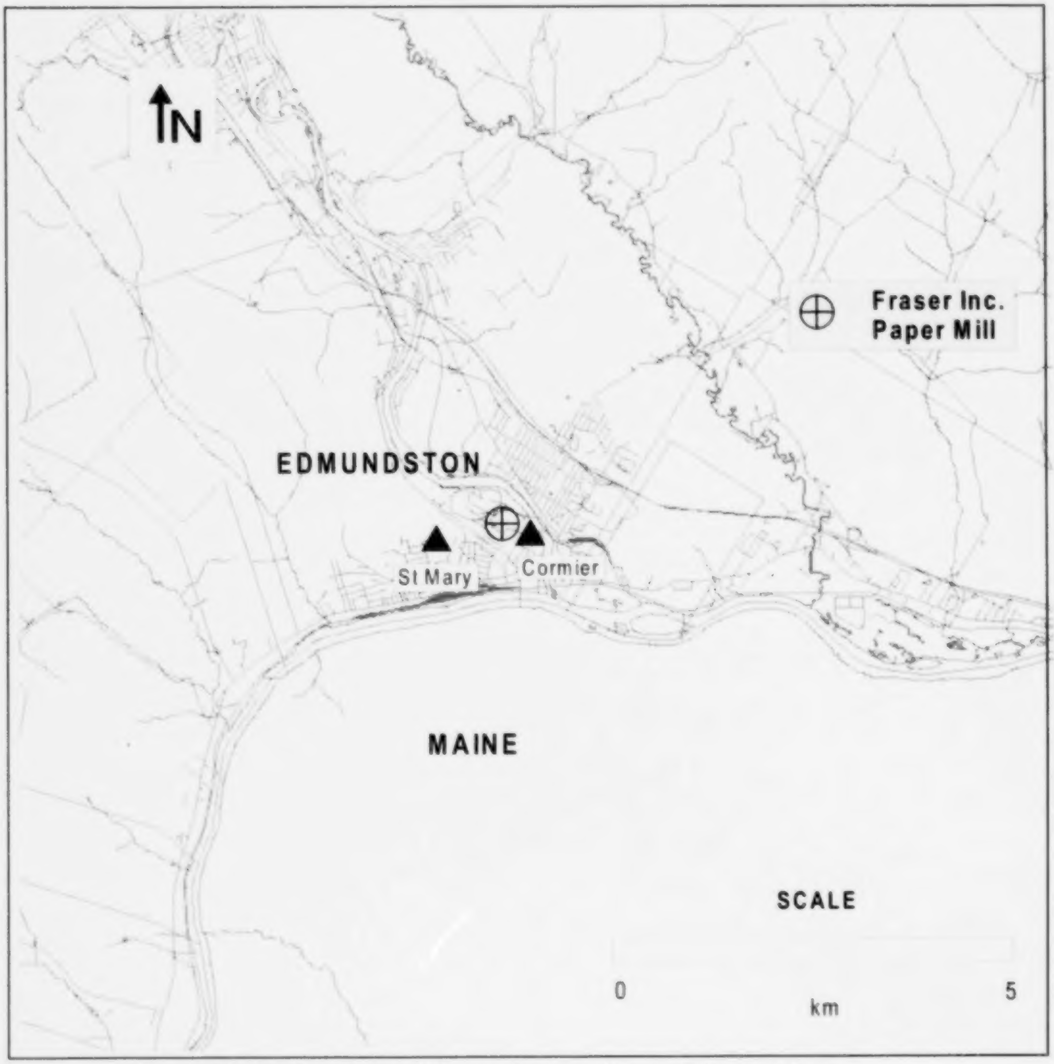


Figure 6. Air quality monitoring sites in Edmundston.

D.2 $PM_{2.5}$

Continuous fine particulate measurements (TEOM) began at the Cormier site in June 2000.

In 2006, there were two days, one in January and one in February, having a daily average exceeding the Canada-wide Standard of 30 micrograms per cubic metre. Statistics are shown in Table 13 and additional results are shown in Appendix I.

Table 12. Exceedances of provincial objectives for SO_2, Fraser Edmunston Network, 2002-2006.

		Cormier School	St. Mary
2006	1-h	0	0
2005	1-h	0	0
2004	1-h	0	0
2003	1-h	0	0
2002	1-h	0	0
2006	24-h	0	0
2005	24-h	0	0
2004	24-h	0	0
2003	24-h	0	0
2002	24-h	40	0

Table 13. Monitoring results for $PM_{2.5}$, Fraser, Edmunston, 2006.

	Cormier
Annual average (micrograms per cubic metre)	7.8
98th percentile value (Canada wide standard statistic)	23.3
Daily average >30 micrograms/ cubic metre	2
Hours with running 24-h average >30	80

E. BELLEDUNE

There are a number of monitoring sites in the Belledune region. Four of these are located for the assessment of emissions from the Xstrata complex, formerly Noranda Inc. Brunswick Smelter. A further five monitors are operated for the assessment of NB Power's coal-fired electrical generating station.

Figure 7 shows the locations of all the monitoring sites in the region.

E.1 Xstrata

All sites in the Xstrata network monitor sulphur dioxide, and three also measure TSP.

E.1.1 Sulphur dioxide

In 2006, there was one exceedance of the 1-h objective at each of the Boulay and Townsite locations. Compliance statistics for SO_2 since 1997 are shown in Table 14.

E.1.2 Total Suspended Particulate

In 2006, there were no exceedances. Compliance statistics for TSP since 1997 are shown in Table 15.

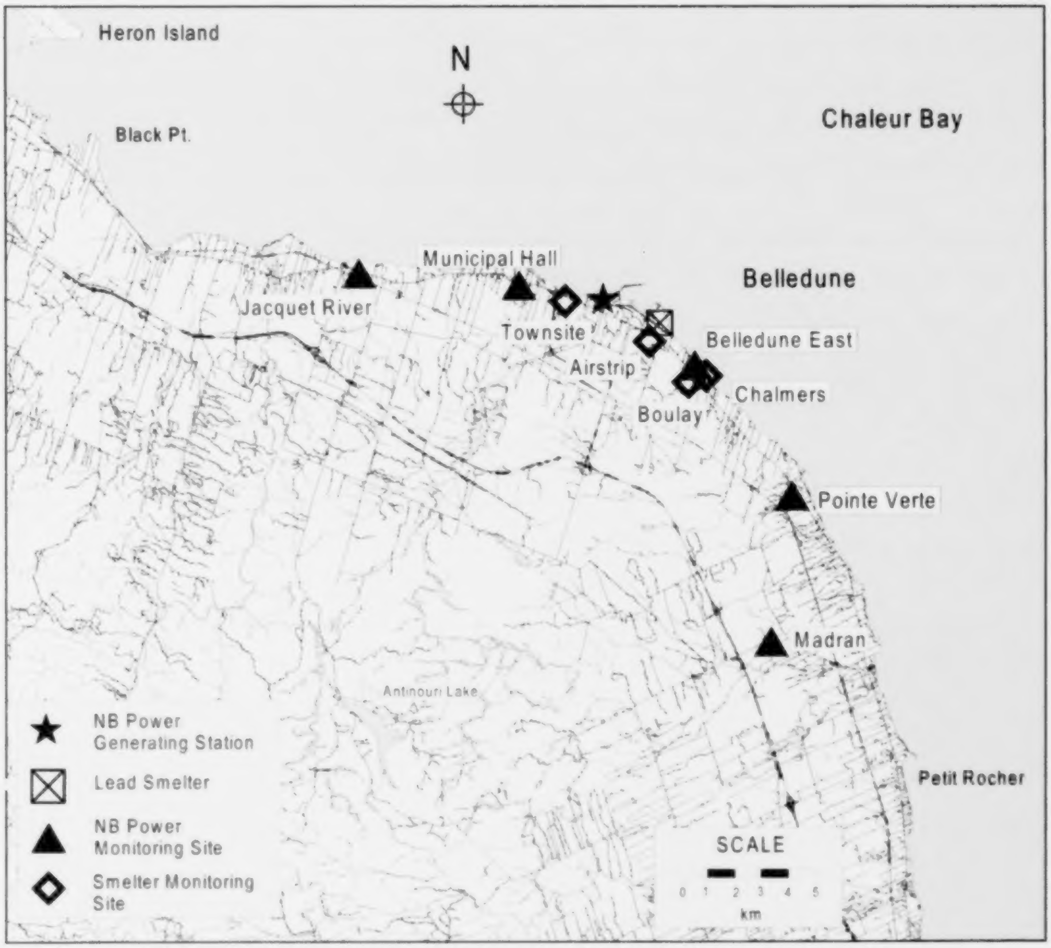


Figure 7. Air quality monitoring sites in the Belledune Network.

Table 14. Exceedances of provincial objectives for SO_2, Xstrata, 1997-2006.

Year	Objective	Airstrip	Boulay	Chalmers	Townsite
2006	1-h		1	0	1
2005	1-h		0	1	1
2004	1-h		0	0	0
2003	1-h	Closed			
2002	1-h	4	1	3	0
2001	1-h	26	4	2	0
2000	1-h	4	2	1	1
1999	1-h	10	1	1	1
1998	1-h	4	4	7	2
1997	1-h	2	1	0	3
2006	24-h		0	0	0
2005	24-h		0	0	0
2004	24-h		0	0	0
2003	24-h	Closed			
2002	24-h	0	0	0	0
2001	24-h	0	0	0	0
2000	24-h	0	0	0	0
1999	24-h	29	0	0	0
1998	24-h	12	0	0	0
1997	24-h	0	0	0	0

Note: In 2003, data were available only for the period January-June.

Table 15. Exceedances of provincial objectives for TSP, Xstrata, 1997-2006.

Year	Objective	Airstrip	Boulay	Chalmers	Townsite
2006	24-h		0	0	0
2005	24-h		0	0	0
2004	24-h		0	0	0
2003	24-h	Closed			
2002	24-h	0		0	0
2001	24-h	0		0	0
2000	24-h	1		0	1
1999	24-h	1		0	0
1998	24-h	0		0	0
1997	24-h	0		0	0

E.2 NB POWER

There are five sites in this network, all of which monitor for sulphur dioxide. Two sites also monitor nitrogen dioxide.

E.2.1 Sulphur dioxide

During 2006, there was one exceedance at each of the Belledune East and Municipal Hall sites. Compliance statistics for SO_2 since 1997 are shown in Table 16.

E.2.2 Nitrogen dioxide

This contaminant is measured at Belledune East and Municipal Hall. There were no exceedances of the applicable 1 or 24-hour objectives in 2006 at either location. There have been no exceedances of NO_2 recorded in this network since 1997.

Table 16. Exceedances of provincial objectives for SO_2, NB Power Belledune Network, 1997-2006.

Year	Objective	Belledune East	Jacquet River	Madran	Municipal Hall	Pointe Verte
2006	1-h	1	0	0	1	0
2005	1-h	0	3	0	0	0
2004	1-h	0	0	0	0	0
2003	1-h	3	0	0	1	0
2002	1-h	4	0	0	0	1
2001	1-h	2	0	0	1	0
2000	1-h	2	0	0	1	0
1999	1-h	1	0	0	0	0
1998	1-h	4	0	0	0	0
1997	1-h	1	0	0	0	0
2006	24-h	0	0	0	0	0
2005	24-h	0	0	0	0	0
2004	24-h	0	0	0	0	0
2003	24-h	0	0	0	0	0
2002	24-h	0	0	0	0	0
2001	24-h	0	0	0	0	0
2000	24-h	0	0	0	0	0
1999	24-h	0	0	0	0	0
1998	24-h	0	0	0	0	0
1997	24-h	0	0	0	0	0

F. DALHOUSIE – NB Power

Figure 8 shows the locations of the sites in the region. The sites in this region are operated to monitor the effects of the NB Power Dalhousie electrical generating station. Six sites measure sulphur dioxide. One of these sites also monitors for TSP, and there is one additional TSP site (7 sites in all). Because of potential pollution transport across the Bay of Chaleur, one of the stations is located in the province of Québec.

F.1 Sulphur dioxide

Compliance with the applicable 1-hour, 24-hour and annual objectives was 100% at all sites in 2006. Detailed summaries are given in Appendix I. There have been no exceedances of SO_2 recorded in this network since 1997.

F.2 Total Suspended Particulate

TSP was measured at the Coal Berm and Dalhousie Tower sites. Results are shown in Appendix I. None of the individual readings obtained was above the 24-hour objective of 120 micrograms per cubic metre in 2006, and the annual geometric means were also below 10 micrograms per cubic metre (the standard is 70 micrograms per cubic metre). There have been no exceedances of TSP recorded in this network since 1997.

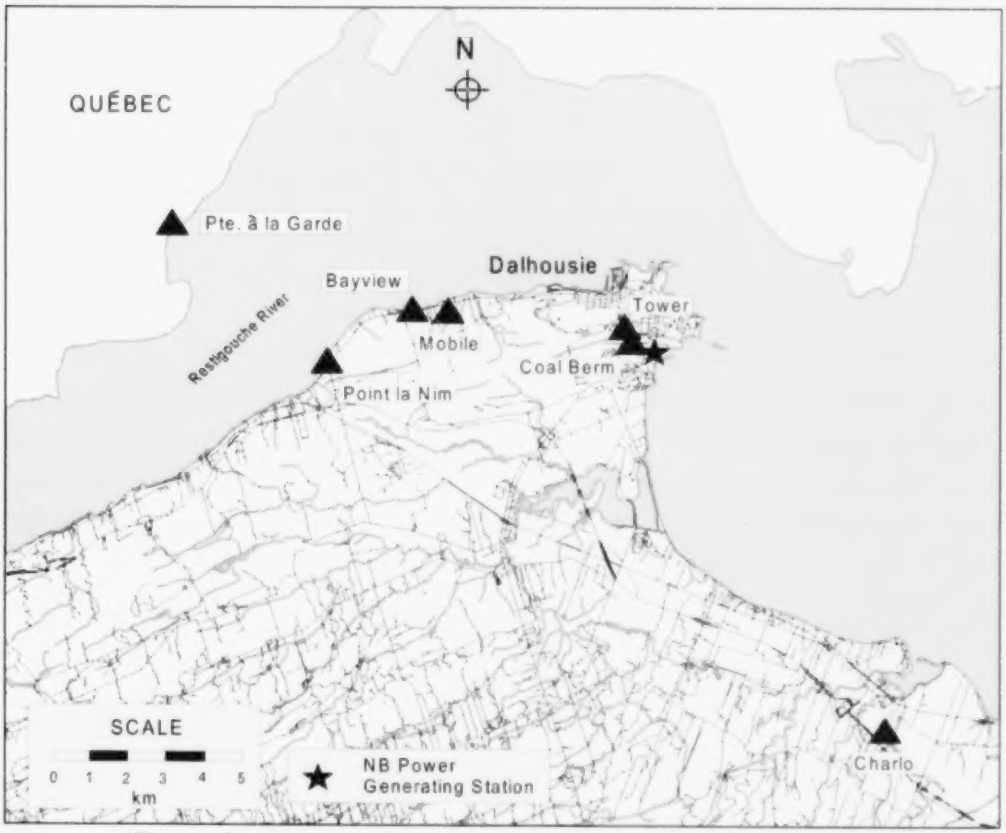


Figure 8. Air quality monitoring sites in the Dalhousie Network.

G. ATHOLVILLE - AV CELL INC.

G.1 Sulphur dioxide

AV Cell Inc. operates a pulp mill in Atholville, and maintains two associated ambient air monitoring sites, Boom Road (to the west of the mill) and Beauvista (east). Sulphur dioxide is measured at both sites.

Compliance during 2006 was 100% with no exceedances of the 1-hour objective (340 ppb), 24-h objective (113 ppb) or the annual objective (23 ppb) at either site. Compliance statistics for SO_2 since 1999 (when the network was established) are shown in Table 17.

H. BATHURST

H.1 Ground level ozone

Ozone monitoring was added in May 2006. There were no exceedances of the national 1-hour objective for ozone during 2006.

H.2 $PM_{2.5}$

2006 was the second year of operation for the site at Rough Waters Drive. Concentrations were low throughout the year. Results are summarised in Table 18.

Table 17. Exceedances of provincial objectives for SO_2, AV Cell Network, 1999-2006.

Year	Objective	Boom Rd (W)	Dairy Queen (E)
2006	1-h	0	0
2005	1-h	0	0
2004	1-h	0	0
2003	1-h	0	0
2002	1-h	0	0
2001	1-h	0	0
2000	1-h	1	0
1999	1-h	0	3
2006	24-h	0	0
2005	24-h	0	0
2004	24-h	0	0
2003	24-h	0	0
2002	24-h	0	0
2001	24-h	0	0
2000	24-h	0	0
1999	24-h	0	0

Table 18. Monitoring results for $PM_{2.5}$, Bathurst, 2006.

	Rough Waters Drive (TEOM)
Annual average (micrograms per cubic metre)	3.4
98th percentile value (Canada wide standard statistic)	11.2
Daily average >30 micrograms/ cubic metre	0
Hours with running 24-h average >30	0

I. FREDERICTON

The Fredericton site is on Aberdeen Street, in an area representative of the "downtown" residential and business district. The site is also considered representative of a wider area for pollutants, such as ozone, which are regional in nature.

I.1 Carbon monoxide

No exceedances of the 1-hour or 8-hour objectives (respectively 30 ppm and 13 ppm) were recorded. Peak values tend to be higher in the colder months than during the summer. There have been no exceedances of CO at this site since it was established in 1999.

I.2 Nitrogen dioxide

No exceedances of the 1-hour or 24-hour objectives (210 ppb and 105 ppb) were recorded. As for carbon monoxide, higher readings are usually recorded in the colder months. There have been no exceedances of NO_2 at this site since it was established in 1999.

I.3 Ground level ozone

There were no exceedances of the national 1-hour objective for ozone during 2006. There is additional discussion of data from the ozone network in section 8.

I.4 $PM_{2.5}$

Fine particulate matter ($PM_{2.5}$) was measured at the Aberdeen Street site using a TEOM instrument, which provides a continuous record of particulate concentrations. Data obtained during 2006 indicated generally moderate to low particulate concentrations. Data are summarised in Table 19.

I.5 Index of the Quality of the Air

Results for 2006 showed air quality in the "good" category for 98.4% of the time, with 1.6% in the "fair" range. Ozone was responsible for the small number of hours in the fair range. Results were made available hourly via recorded voice message at 451 6000.

Table 19. Monitoring results for $PM_{2.5}$, Fredericton, 2006.

	Aberdeen St (TEOM)
Annual average (micrograms per cubic metre)	4.4
98th percentile value (Canada wide standard statistic)	15.4
Daily average >30 micrograms/ cubic metre	0
Hours with running 24-h average >30	0

J. NACKAWIC

Sulphur dioxide, total reduced sulphur and total suspended particulate are measured at the Caverhill Road site, as well as wind speed and direction. During 2006, there was one 1-h TRS exceedance detected at the Caverhill Road site.

The compliance history for TRS since 1999 is shown in Table 20. As for SO_2 and TSP, no exceedances were recorded at this site during 2006.

Table 20. Exceedances of provincial objectives for TRS, Nackawic Network, 2006.

Year	Objective	Caverhill Road
2006	1-h	1
2005	1-h	M
2004	1-h	6
2003	1-h	1
2002	1-h	6
2001	1-h	0
2000	1-h	6
1999	1-h	4
2006	24-h	0
2005	24-h	M
2004	24-h	19
2003	24-h	0
2002	24-h	0
2001	24-h	0
2000	24-h	0
1999	24-h	33

Note: results for 2004 based on 8 months of operation. The Nackawic mill was shut down in August 2004 and remained closed at the end of the year. M= missing data.

K. MONCTON

The Moncton air quality monitoring site is situated at the Highfield Street water pumping station. The site location was chosen to provide readings representative of the central city suburbs. In addition, this site may also be influenced by emissions from vehicles or institutional heating systems, as well as regional pollutants such as ozone.

K.1 Carbon monoxide

No exceedances of hourly or 8-hourly objectives for carbon monoxide occurred during 2006. Readings were similar to those recorded in downtown Saint John and Fredericton, remaining well below objectives. No exceedances of CO objectives have been recorded since monitoring began in 1998.

K.2 Nitrogen dioxide

No exceedances of hourly or 24-hourly standards for nitrogen dioxide were recorded during 2006. No exceedances of NO_2 objectives have been recorded since monitoring began in 1998.

K.3 Ground level ozone

There were no exceedances of the hourly objective for ozone (82 ppb). More discussion of ozone data may be found in the section on long term trends.

K.4 $PM_{2.5}$

The 2006 results revealed that the maximum 24-h value was 25 µg/m^3. Data are summarized in Table 21.

K.5 Index of the Quality of the Air

Hourly IQUA reports are generated for the Moncton site and made available via recorded message at 851 6610. Summary statistics for 2006 indicated that good air quality was recorded for 98.7% of all hours, and fair for 1.3%.

Table 21. Monitoring results for $PM_{2.5}$, Moncton (TEOM), 2006.

	Highfield St.
Annual average (micrograms per cubic metre)	3.4
98th percentile value (Canada wide standard statistic)	15.3
Daily average >30 micrograms/ cubic metre	0
Hours with running 24-h average >30	0

L. ST. ANDREWS

The St. Andrews monitoring station is located on the grounds of the Huntsman Marine Science Centre (H.M.S.C.) and is operated with the support of staff from the Centre and DENV. This site has been used for a variety of special sampling projects and is especially suitable for investigating trans-boundary air pollution. Currently, projects operated at St. Andrews by the province include ozone and $PM_{2.5}$ monitoring. Additionally, mercury concentrations in air are monitored at this site, in collaboration with Environment Canada. Currently, this is the only location in the province where these mercury measurements are made, and one of only two locations in the Maritimes.

L.1 $PM_{2.5}$

In general, readings were very low at this site. Data are summarized in Table 22.

L.2 Mercury monitoring

Mercury is of concern as an environmental contaminant because of its ability to accumulate in living organisms, potentially reaching concentrations which could pose a hazard to health in humans and wildlife (e.g. NESCAUM, 1998). Although mercury has been recognised as an environmental pollutant for decades, relatively little monitoring and assessment of the transport and behaviour of mercury in the atmosphere has taken place. Most attention has been paid to direct discharges, for example of industrial, water-borne effluents. In 1998, the New England Governors and Eastern Canadian Premiers identified mercury as a substance of concern in eastern Canada and the United States, and developed an Action Plan to improve our understanding of its impacts, and also proposed measures to reduce man-made emissions (NEGECP, 1998). Since that time, Canada-wide Standards for mercury have been adopted in Canada to further reduce mercury emissions.

Table 22. Monitoring results for $PM_{2.5}$(TEOM), St Andrews, 2006.

	H.M.S.C.
Annual average (micrograms per cubic metre)	3.5
98th percentile value (Canada wide standard statistic)	11.3
Daily average >30 micrograms/ cubic metre	0
Hours with running 24-h average >30	0

Mercury monitoring conducted at St. Andrews contributes to the scientific understanding of mercury in the environment. The results are used in research (for example, into atmospheric processes) as well as in wildlife and other studies.

Table 23 summarises results of the mercury monitoring program. These monitoring studies are operated cooperatively between Environment Canada, the Huntsman Marine Science Centre, and DENV.

There are no environmental guidelines or objectives for mercury in air or precipitation at present. The data may be used to look for patterns or trends over time, and to compare regionally with other locations. They are also used as input to ecological models which attempt to track how mercury moves though different components of the environment.

In ambient air, the concentration of mercury in vapour form is approximately 1.5 nanograms per cubic metre as an annual average. These values are similar to those measured in Nova Scotia, and lower than readings obtained at sites in parts of New England, where they typically range from 2 to 3 nanograms per cubic metre (NESCAUM, 1998).

Table 23. Mercury monitoring results, 1995-2006.

Ambient Air			
St Andrews		Other sites	
Year	Annual Average (ng/ cubic metre)	Site	Annual averages (ng/cubic metre)
1995	1.9	Mt Mansfield, VT	2.0 (94-96)[1]
1996	1.5	Kejimkujik, NS	1.5 (2004)[3]
1997	1.4	Westfield, NY	2.6 (94-96)[1]
1998	1.4	Moss Lake	2.4 (94-96)[1]
1999	1.6		
2000	1.4		
2001	1.4		
2002	(1.2)‡		
2003	1.5*		
2004	1.3		
2005	Unavailable		
2006	1.2		
Precipitation (rain and snow)*			
Year	Total mercury concentration (ng/L)	Kejimkujik, N.S.	Total mercury concentration (ng/L) [2]
1998	6.5	1998	5.3
1999	6.7	1999	4.9
2000	6.7	2000	5.4
2001	7.2	2001	6.6
2002	5.0	2002	5.4
2003	5.6	2003	5.0
2004	closed	2004	5.2
		2005	4.4
		2006	5.4

Notes:
ng = nanograms. 1 nanogram is one thousand-millionth of a gram. Ambient air mercury data supplied by Environment Canada.

‡ Note: in 2002, sampler operated only January-July.
* In 2003, sampler operated May-December

References:
[1] NESCAUM (1998)
[2] NADP
[3] Environment Canada

The 2006 results showed the lowest air concentrations of mercury that have been recorded at the site with 1.2 ng/m^3.

4. RURAL OZONE NETWORK

Figure 9 shows the locations of the sites which monitor ground level ozone in New Brunswick. This network is operated to assess the impact of long-range transported ozone. It focuses on the southern portion of the province, which is the region most affected by long range transport, as shown by special short-term monitoring studies and trajectory analyses (e.g. Fuentes and Dann, 1994; Tordon et al., 1994; Multistakeholder NOx/VOC Science Program, 1997a, 1997b). Ozone monitoring at the Bathurst site commenced in May 2006.

The 1-h objective of 82 ppb was exceeded at one station. Indeed, three exceedances occurred at the elevated monitoring site in Fundy Park. The number of hours of exceedance is quite variable from year to year, being heavily influenced by the weather. Results are summarised in Table 24. Monthly means and extremes are shown in Appendix I.

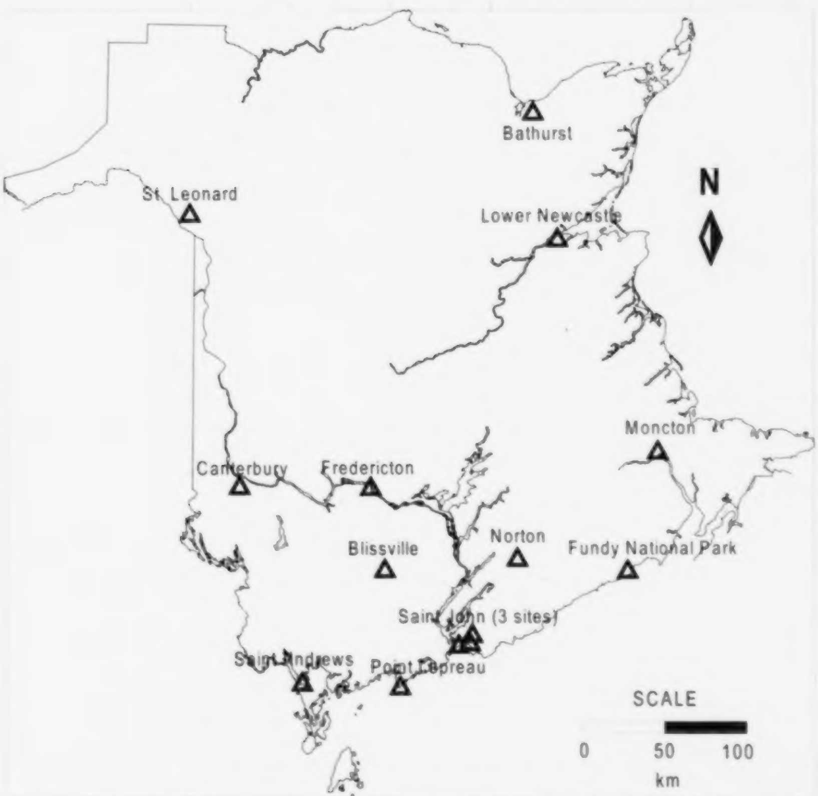


Figure 9. Locations of ozone monitoring sites in New Brunswick, 2006.

A. Air quality Advisories

DENV works with Environment Canada and the Department of Health and Wellness in the preparation and dissemination of daily forecasts of ozone. DENV maintains the monitoring network and supplies real-time data to Environment Canada forecasters, who issue twice-daily forecasts of ozone concentrations. When forecast data indicate that the 1-hour Air Quality Objective for ozone will be exceeded or closely approached, air quality and health advisories are issued to the media to provide advance notice to the public. Advisories may be issued for specific regions of the province.

In recent years, air quality advisories may also be issued when levels of fine particulate ($PM_{2.5}$) are expected to rise above 30 µg/m^3 for an extended period. For example, when smoke from forest fire within the region are forecasted to affect air quality in New Brunswick.

There were no smog advisories issued by Environment Canada in 2006. However, a special weather statement was issued on September 17 due to smoke affecting the Maritime region from forest fires in northestern Ontario.

Table 24. Exceedances of the 1-hour ozone objective (number of hours), 2006.

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Blissville													0
Canterbury													0
Customs													0
Forest Hills													0
Fredericton													0
Fundy Park					2		1						3
Hillcrest													0
Lower Newcastle													0
Mobile (Saint John)	-	-	-	-	-	-	-	-	-	-	-	-	--
Moncton													0
Norton													0
Pt. Lepreau													0
St. Andrews													0
St Leonard													0
Total	0	0	0	0	2	0	1	0	0	0	0	0	3

The 1- hour National Objective is 82 ppb.

-- = missing data.

5. CANADA-WIDE STANDARDS (CWS)

A. Canada-wide Standard for Ozone

Figures 10 and 11 show Canada-wide Standard values for 2006 and the previous six years. Each plotted point is calculated as the average of three years ending at that time, i.e. the point for 2006 is the average for the years 2004-2006. The CWS is 65 ppb. Figure 10 shows results for urban stations and results for rural sites are shown in Figure 11. In recent years, most results remained below the CWS criterion.

The compliance date for the Canada-wide Standards for ozone and $PM_{2.5}$ is 2010.

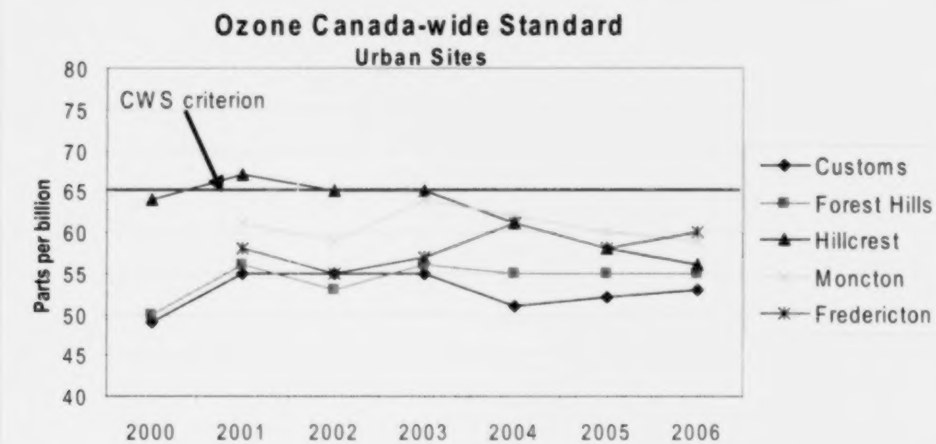


Figure 10. Canada-wide Standard results for ozone at urban sites, 2000-2006.

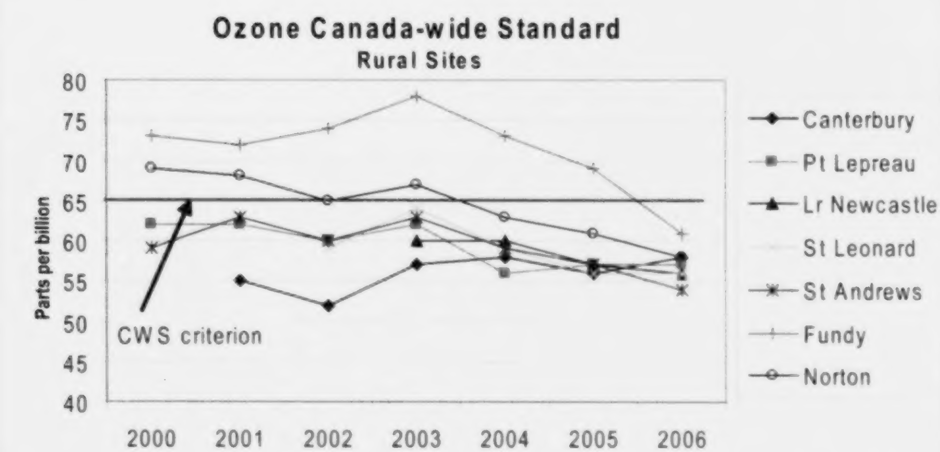


Figure 11. Canada-wide Standard results for ozone at rural sites, 2000-2006.

B. Canada-wide Standard for $PM_{2.5}$

Figures 12 and 13 show CWS results for $PM_{2.5}$. Figure 12 shows results for various sites in New Brunswick and Figure 13 shows results for stations in Saint John. The CWS is 30 micrograms per cubic metre. As for the ozone CWS charts, each plotted point is a three-year average. The period of record varies between sites. Results at all stations have remained below the CWS standard to date, and have fallen since 2003. Years where all stations show higher values are usually caused by forest fire smoke events, that often affect wide areas of the province at the same time.

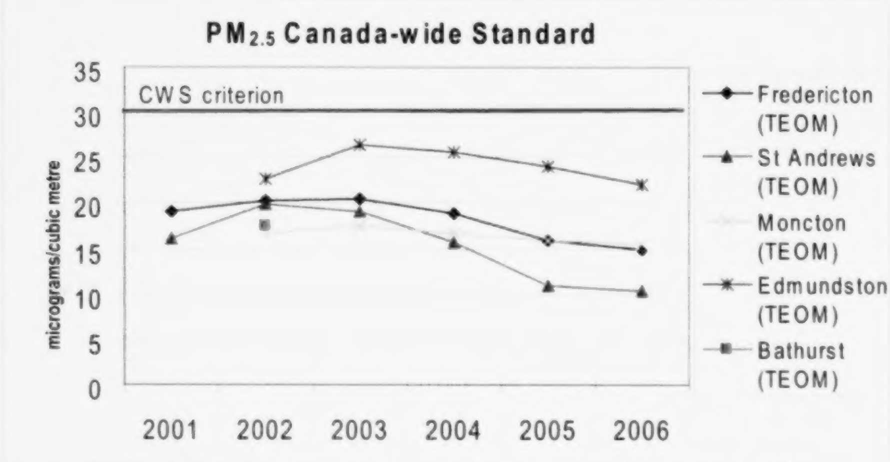


Figure 12. Canada-wide Standard results for $PM_{2.5}$, 2001-2006.

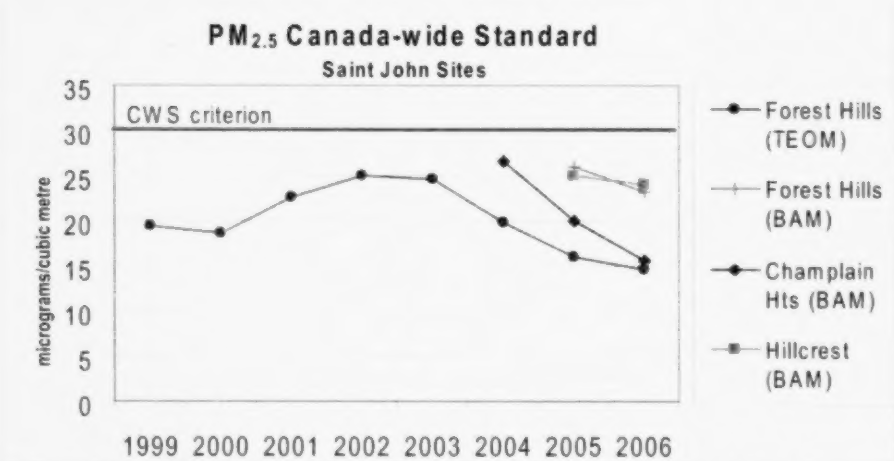


Figure 13. Canada-wide Standard results for $PM_{2.5}$ at Saint John sites, 1999-2006.

Note: results for Champlain Heights and Hillcrest are for two years. For notes on the TEOM and BAM technologies, see page 7.

6. ACID PRECIPITATION NETWORK

Emissions of sulphur dioxide and nitrogen oxides can be transformed in the atmosphere to acidic particles which ultimately fallout as acid deposition, in both wet and dry form. Acid precipitation, or acid rain, refers to the wet form of acid deposition.

The potentially adverse impacts of acid precipitation have been recognized since the early 1980's. Acid precipitation effects occur at a broad regional level, not just close to the sources of the contaminants themselves. The emissions which cause acid precipitation typically travel long distances, hundreds or even thousands of kilometers, before returning to the surface in rain or snow. In New Brunswick, acid deposition is affected by local emissions and the emissions from several large industrial regions which are located upwind, including the American Midwest, southern Ontario and Québec, and the Washington-Boston region. The same emissions also contribute to regional haze and fine particulate pollution.

Consequently, measures to reduce emissions that contribute to acid rain have been underway in North America since the late 1980's. Over the past two decades sulphur dioxide emissions from major sources within New Brunswick have been reduced significantly including new commitments to reduce emissions under the Canada-wide Acid Rain Strategy for Post-2000.

New Brunswick has operated an extensive acid precipitation (rain and snow) monitoring network since the early 1980s. Since 1987, this has been a partnership effort with logistical and financial support from NB Power. In 2006 there were 13 acid precipitation monitoring stations in operation, which are predominantly located in remote rural areas. Figure 14 shows the location of the acid precipitation monitoring sites in New Brunswick. All precipitation samples are analyzed at the DENV laboratory, and DENV staff co-ordinate the monitoring program, perform data quality assurance, and maintain the official data archive.

The severity of acid rain impact is generally measured by computing how much sulphate (a measure of sulphuric acid) falls on each hectare of land over one year. In Canada, critical loads are defined as the level of acidic deposition that a specific area can tolerate without harm. Critical loads take into account the nature of individual watersheds and their susceptibility to the effects of acidification. Critical loads for acidification in New Brunswick range from less than 8 up to 11 kg/ha/yr of acid sulphate deposition. The lowest values of less than 8 kg/ha/yr are designed to protect the most sensitive areas that typically have granite bedrock (e.g. areas of southwestern and central northern New Brunswick), and 11 kg/ha/yr for most of the rest of the Province.

Sulphate wet deposition for the 10 year period of 1997-2006 is shown in Table 25. Acid deposition values in 2006 were close to the same or higher at almost all stations compared to 2005. For sites with a complete data record for the year, acid deposition in 2006 ranged from as low as 9.07 kg/ha/yr at Coles Island to as high as 16.69 kg/ha/yr at Fundy Park.

In recent years, acid deposition has been declining slowly. Although encouraging, the data also show the acid rain issue remains important in New Brunswick, as critical loads for acid rain continue to be exceeded, especially in the south. This remained true in 2006. Deposition values exceeded critical loads in most areas. As a result, more effort to reduce emissions is required to reduce acid deposition further and ensure that the more sensitive lakes and rivers are provided with long-term protection from acid damage.

The amount of acid precipitation is a naturally variable indicator of acid deposition because it is closely associated with the amount of precipitation that falls during the course of the year at a given monitoring site. As a result, there will always be significant variability in annual deposition values as a function of rain and snow levels each year.

In 2006, total annual precipitation was near normal across most of the province, with a 10% surplus in northern and southwestern NB and a 10-20% deficit across central and southern NB.

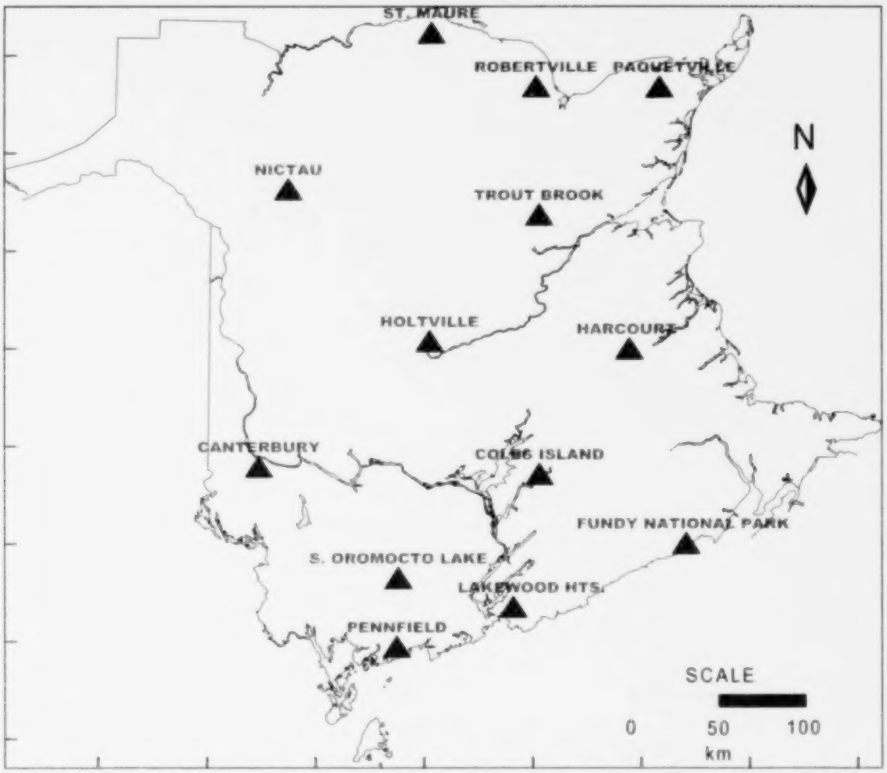


Figure 14. Location of acid rain monitoring sites in New Brunswick, 2006.

Table 25. Sulfate wet deposition at New Brunswick monitoring sites, 1997-2006.

Site	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
St. Maure	8.16	14.42	11.18	9.73	7.14	8.08	8.53	7.77	10.63	10.54
Robertville	8.42	13.53	10.61	9.48	7.98	10.08	7.25	7.48	11.36	12.13
Petit Paquetville	9.80	10.83	9.36	8.89	8.33	7.64	7.24	7.11	10.07	10.86
Nictau	8.56	15.04	11.19	0.86%	9.367	9.59	7.08	8.00	9.31	11.47
Trout Brook	11.82	11.26	8.44	8.36	9.89	9.12	9.04	6.42	10.74	10.83
Holtville	10.25	14.42	9.79	11.48	8.94	10.58	10.75	8.29	12.01	12.21
Harcourt	9.89	12.53	9.05	9.82	7.50	10.00	9.81	7.27	9.50	10.31
Canterbury	10.54	8.93	9.8	10.49	8.46	10.47	9.58	7.32	13.53	4.48^
Fundy	17.04	18.28	13.99	19.04	10.62	15.07	13.23	12.66	15.43	16.69
South Oromocto Lake	12.69	16.86	11.52	13.17	9.60	10.95	11.14	5.80*	2.97&	11.71
Lakewood Heights	17.21	18.29	13.27	16.36	10.17	14.94	16.89	12.83	13.01$	14.49
Pennfield	13.88	17.89	13.93	14.20@	10.49	13.30	12.03	12.12	16.45	15.53
Coles Island	16.4	13.32	9.35	12.28	7.44	10.84	10.62	8.28	9.20	9.07

% 6 weeks only. @ 41 weeks only. * 27 weeks only. $ 48 weeks only. & 11 weeks only. ^ 23 Weeks only.

Another useful indicator of acid deposition is the average annual sulphate concentration in precipitation, averaged across all sites operating in each year. The results are shown in Figure 15, which also shows the number of sites operating in each year. The trend overall is downward since 1989, although this downward trend appears to have moderated in recent years. The downward trend confirms that reductions in sulphur dioxide emissions in New Brunswick, elsewhere in eastern Canada and the United States are continuing to have a beneficial effect on acid rain in the province.

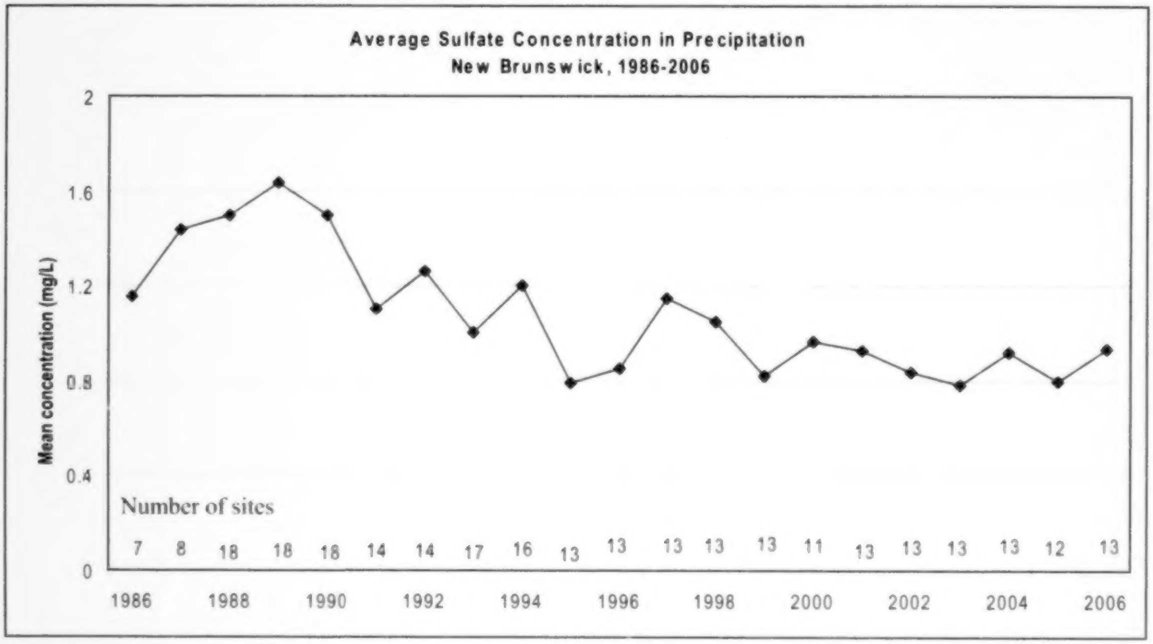


Figure 15. Network-wide mean annual sulphate concentration in precipitation in New Brunswick, 1986-2006.

7. MOBILE AIR QUALITY MONITORING UNIT

To help in evaluating air quality in New Brunswick, the Department of the Environment has developed a mobile air quality monitoring unit. It augments monitoring carried out at established monitoring sites and can be moved to most areas of the province, fulfilling temporary monitoring needs. The vehicle is presently able to measure the following pollutants: sulphur dioxide, nitrogen oxides, ozone, total reduced sulphur (including hydrogen sulphide) and fine particulate matter ($PM_{2.5}$). The vehicle is also fitted with a retractable 10-metre mast with wind speed and direction instruments.

The mobile air monitoring vehicle is being used in the following applications:

- Assessment of the local impact of point or area emission sources
- An evaluation tool in responding to local air quality issues
- Site evaluation prior to establishing a permanent monitoring site
- Comparative analysis studies with permanent monitoring sites
- Validation of predictive air quality modelling studies
- Determination of background or baseline air quality
- Investigating a planned or sustained event that has potential for air quality impacts.

2006 Operations

During 2006, the mobile unit was operated from January to November at the Saint John Community College in east Saint John. The site is approximately midway between the Champlain Heights and Forest Products site (see Figure 2). The purpose of monitoring at this location was to investigate air quality in an area that is not represented by the existing monitoring network.

Monitoring results are summarized in Table 26. When interpreting the results, attention should be paid to the amount of time that monitors were operating in each month (indicated as "coverage" in Table 26). During the monitoring period, one exceedance of the 1-hour average objective for SO_2 was recorded.

Table 26. Data summary for the mobile monitoring unit (TEOM), 2006.

Saint John Community College				
	Jan.-March	April-June	July- Sept.	Oct.-Dec.
SO_2				
Coverage (%)	89	77	18*	74
1-h exceedances (>170 ppb)	1	0	0	0
24-h exceedances (>56 ppb)	0	0	0	0
Peak 1-hour value (ppb)	175	17	15	38
Monthly mean (ppb)	3.3	0.3	0.3	1.6
TRS				
Coverage (%)	85	85	89	71
1-h exceedances (>11 ppb)	0	0	0	0
24-h exceedances (>3.5 ppb)	0	0	0	0
Peak 1-hour value (ppb)	2	0	0	0
Monthly mean (ppb)	0	0	0	0
NO_2				
Coverage (%)	89	89	55*	74
1-h exceedances (>210 ppb)	0	0	0	0
24-h exceedances (>105 ppb)	0	0	0	0
Peak 1-hour value (ppb)	0	0	0	0
Monthly mean (ppb)	0	0	0	0
$PM_{2.5}$				
Coverage (%)	85	85	84	73
Max 24-h average (micrograms/cubic metre)	16	18	17	12
Mean (micrograms/cubic metre)	6.2	5.9	6.8	4.9

Note: "coverage" means the percentage of the hours in each month for which valid data were obtained.

* Technical problems.

8. LONG TERM AIR POLLUTION TRENDS

In addition to examining air quality monitoring results for a given year, it is often informative and revealing to compare annual results to previous years, and consider longer term trends. This provides information on how air quality may be changing over the years, and whether emission control measures as applied to industrial operations and consumer products (notably vehicles and fuels) are influencing long- term environmental quality. As mentioned in the introduction, air quality monitoring has been ongoing in parts of the province since the 1970s, especially in the Saint John region. In this section, data for key locations with long-term records are presented to provide information on air quality trends.

A. Carbon Monoxide

Customs Building

The only long-term site for this substance is the Customs Building site in uptown Saint John. The earlier part of the record (prior to 1991) is from the nearby Post Office location. Results are predominantly influenced by motor vehicle emissions. Generally, annual average levels of CO have improved over the long term since the 1980's. Even in recent years, the frequency of annual averages greater than 0.4 ppm has decreased. This may be the result of a greater proportion of vehicles fitted with emissions control equipment, such as catalytic converters. In 2006, carbon monoxide concentration decreased slightly compared to results from 2003 to 2005.

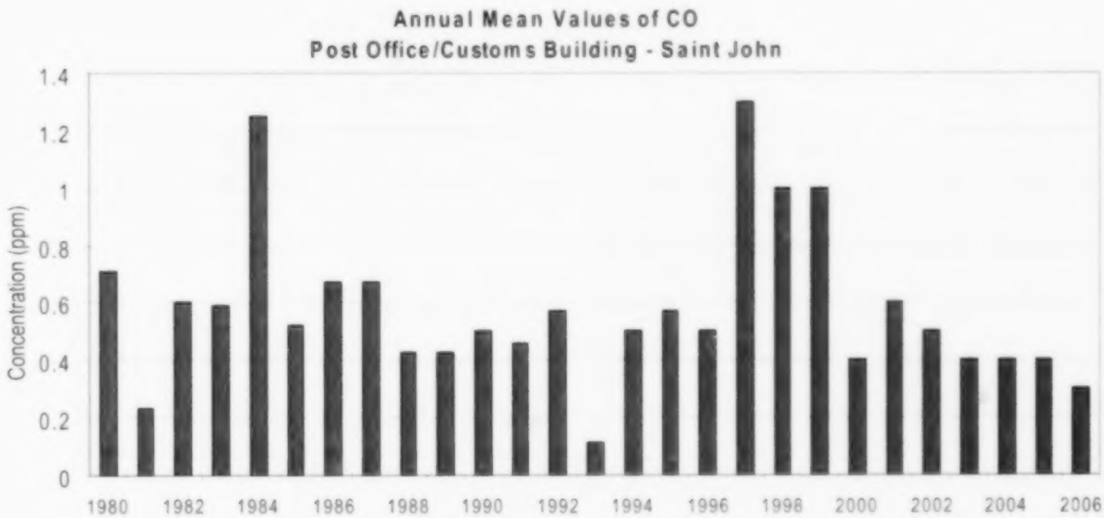


Figure 16. Annual mean values of carbon monoxide, Post Office/Customs Building, Saint John, 1980-2006.

Fredericton and Moncton

The record to date at these stations shows similar improvement as recorded at the Saint John-Customs location. Carbon monoxide in Moncton has been steadily decreasing since 2001 and levels in Fredericton have also improved since 2002.

B. Nitrogen dioxide

Forest Hills

Nitrogen dioxide is another key pollutant emitted by motor vehicles, as well as industrial sources. The trend at Forest Hills, in suburban east Saint John, appears to be downward since 1981. In 2006, the annual average was the lowest level in recent years (3.4 ppb).

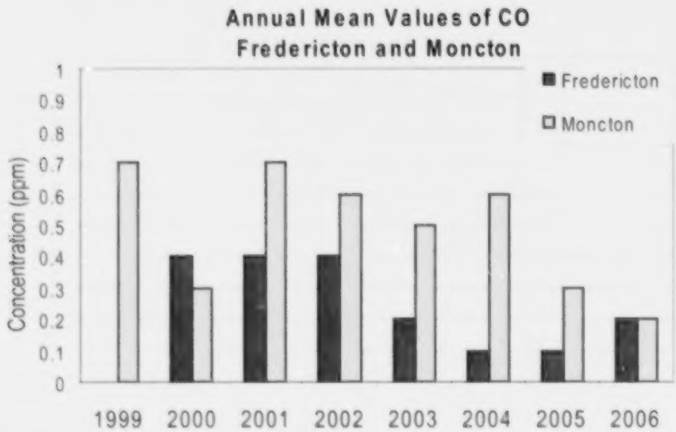


Figure 17. Annual mean values of carbon monoxide, Fredericton and Moncton, 1999 -2006.

Figure 18. Annual mean nitrogen dioxide at Forest Hills, Saint John, 1981-2006.

Forest Hills is influenced by emissions from local industries as well as the more diffuse sources such as vehicles.

Customs Building

In 2006, the annual mean fell again from the higher level seen in 2003 (thought to be due to increased construction activity in the area).

Fredericton and Moncton

The record for these centres is less than 10 years, but is presented for comparison. NO_2 values appear to be slighly higher on average at the Moncton station. 2006 results were lower than 2005 at both Fredericton and Moncton.

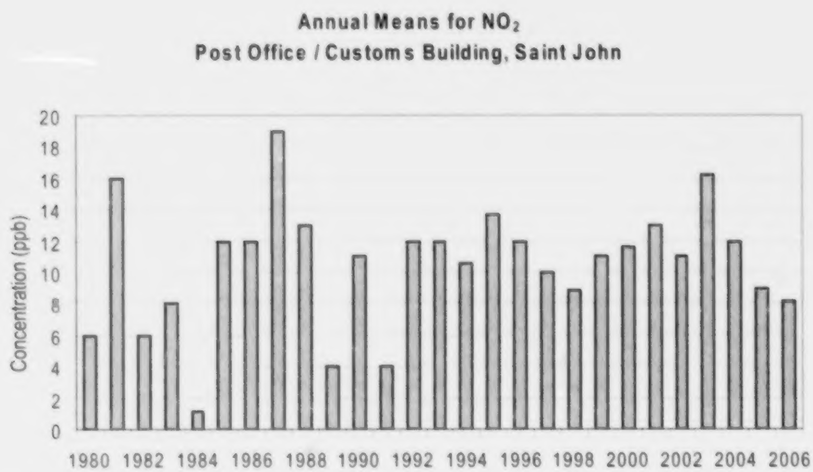


Figure 19. Annual mean nitrogen dioxide at Customs Building, Saint John, 1980-2006.

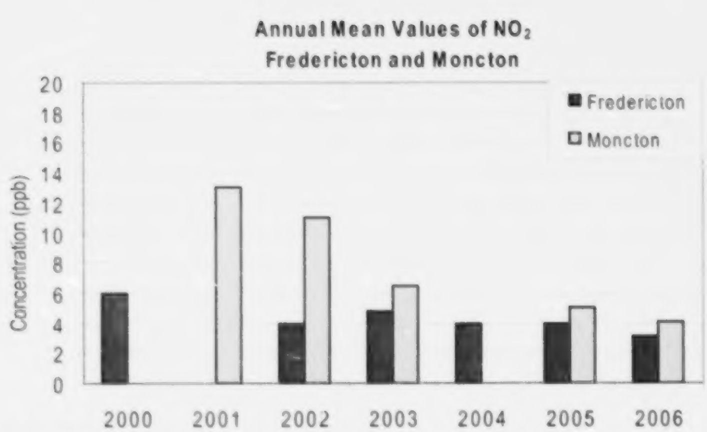


Figure 20. Annual mean nitrogen dioxide at Fredericton and Moncton, 2000-2006.

C. Sulphur dioxide

Forest Hills

Since 1999, average SO_2 levels have continued to decrease at the site and in 2006, the level was 4 ppb and only in one other year (2002) was the level reached before (Figure 21). Air quality monitored at the Forest Hills site in east Saint John is influenced by several local industries including power generating stations, the pulp and paper sector, and an oil refinery.

The annual average SO_2 levels recorded over the past 5 years at this site are the lowest in any previous 5 year period.

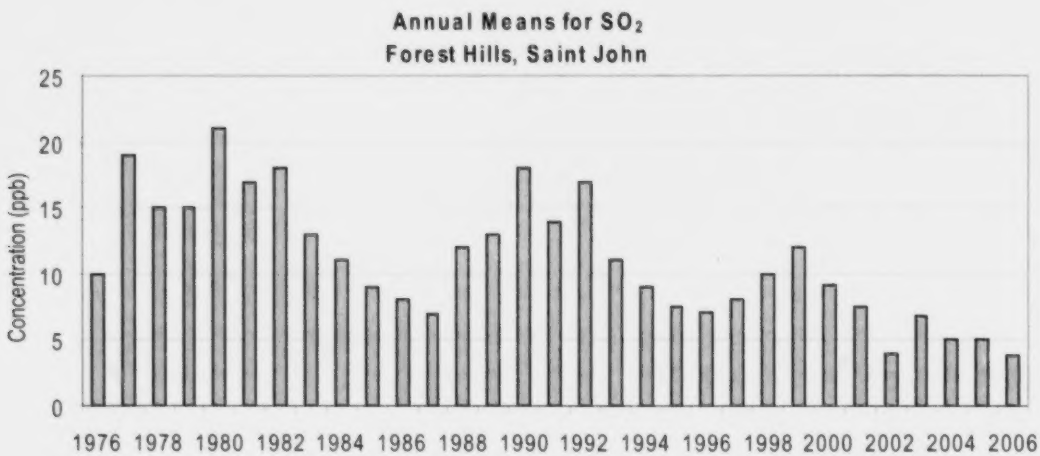


Figure 21. Annual mean sulphur dioxide at Forest Hills, Saint John, 1976-2006.

Customs Building

In uptown Saint John, as represented by records from the Post Office and Customs Building sites, the sulphur dioxide trend has been downward since the mid-1970s. Recently, levels have been approximately 30% of those common in the early 1980s. Decreasing concentrations in this part of the city are probably due to a variety of reasons, including reduced emissions from the Reversing Falls pulp and paper mill, which fell by about 70% from 1980 to 1995. Reduced emissions from the NB Power Courtenay Bay generating station (down 74% from 1990 to 1995) may also be partly responsible. Other reasons include the closure of the Lantic sugar refinery in 2002, new regulations reducing the sulphur content of gasoline, and the increasing use of natural gas.

The annual mean in 2006 is the lowest in the record so far, continuing a downward trend since 1999 (1 ppb) (Figure 22).

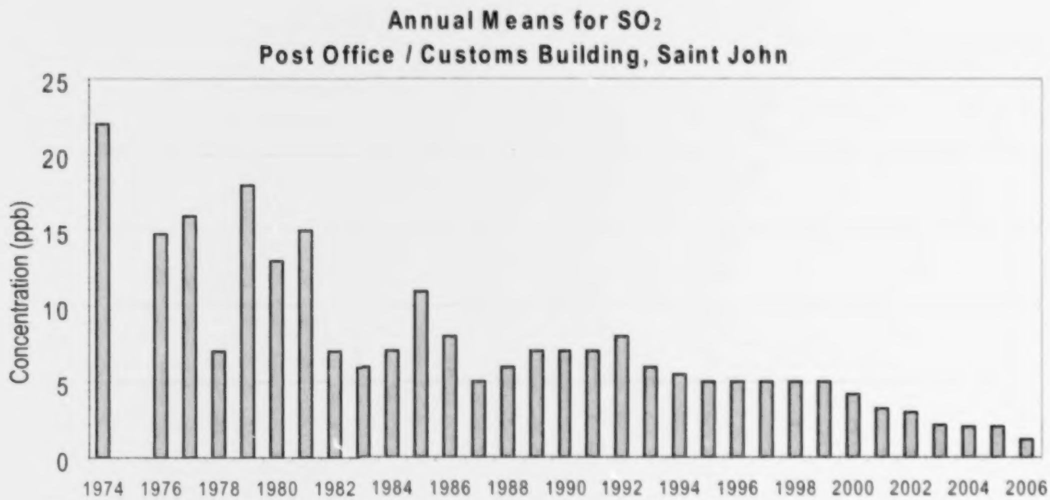


Figure 22. Annual mean sulphur dioxide at Post Office/Customs Building, Saint John, 1974-2006.

Hillcrest

This site in west Saint John is influenced by several sources of SO_2 including the Reversing Falls pulp and paper mill and the Moosehead brewery. Since 1992, the data show a rising trend until 1997 and then falling thereafter. In 2006, the annual mean was 2.4 ppb (Figure 23).

Saint John – All sites

To examine the city-wide trend, a composite average of three sites (Hillcrest, Forest Hills and Customs Building) operated by DENV in the Saint John network was calculated. The trend is shown in Figure 24.

The results shows a downward trend from 1997, with the exception of 1999. In 2006, the network-wide annual average fell to 2 ppb, the lowest level ever.

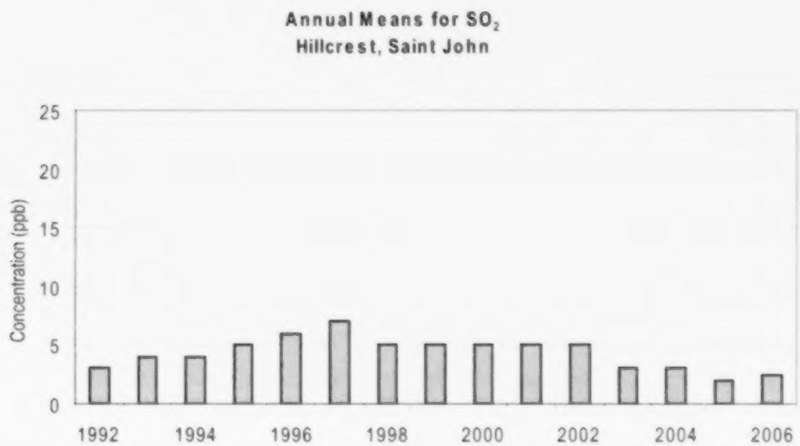


Figure 23. Annual mean sulphur dioxide at Hillcrest, Saint John, 1992-2006.

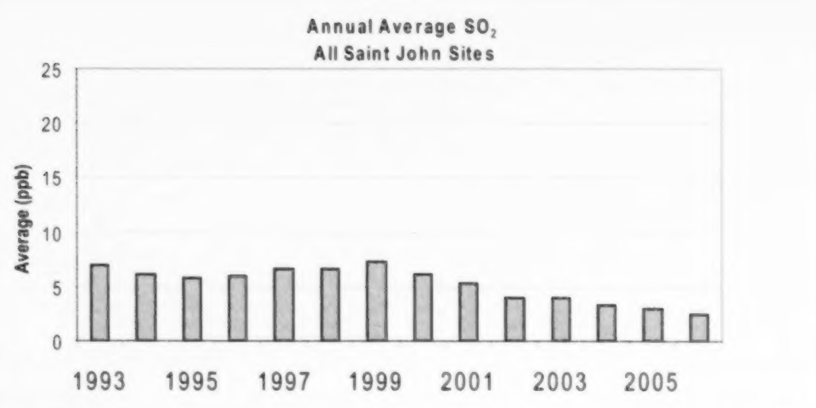


Figure 24. Trend in sulphur dioxide in Saint John, annual network average, 1993-2006.

D. Ground level ozone

As explained in section 4, ozone is a regionally transported pollutant which is not emitted directly from smokestacks or tailpipes, but which forms in the air when other pollutants mix and react together. As such, trends in ozone are due to changing emissions of the pollutants that lead to ozone formation (nitrogen oxides and volatile organic compounds) over a large upwind area of eastern Canada and the United States. Seasonal weather, especially summer conditions, also has a major influence on the amount of ozone affecting New Brunswick.

Forest Hills

At Forest Hills, although ozone levels do not appear to have changed significantly overall since 1980 when O_3 levels were first recorded at this site, there has been an increasing trend since 2000 (Figure 25). The annual mean for 2006 was similar to 2005.

Customs Building

At the Customs site, annual averages for ozone have also been variable over the period of record and like Forest Hills, there is no clear trend over the long term (Figure 26). As at Forest Hills, the 2006 results were similar to 2005 however, like Forest Hills, there has been an increase since 2000.

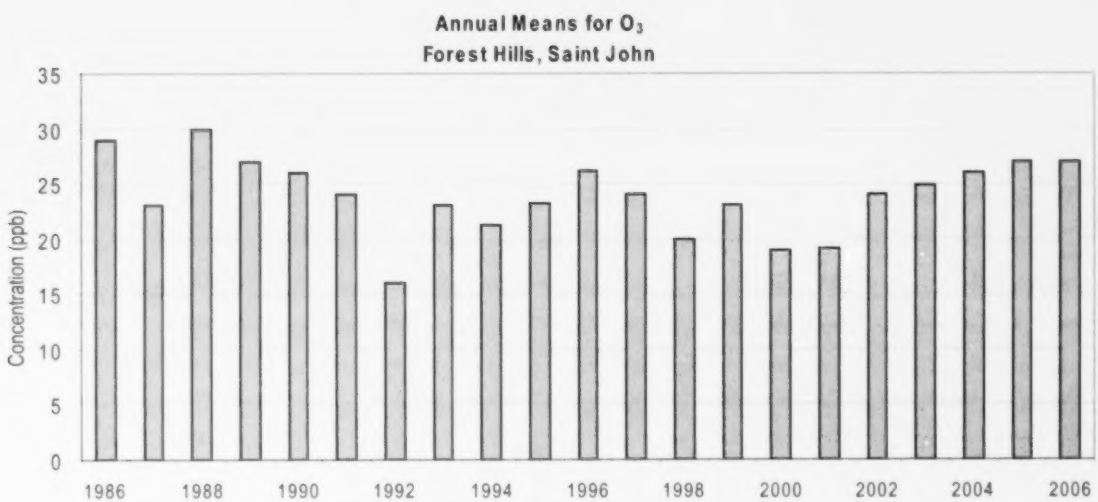


Figure 25. Annual mean ozone at Forest Hills, Saint John, 1986-2006.

Point Lepreau

Data for this site are included to provide a perspective from a rural location which is almost always upwind of major sources of air pollutants in southern New Brunswick. Annual ozone levels are usually somewhat higher than those seen in the Saint John area (Figure 27). This is because urban sites typically have higher concentrations of pollutants that react with and remove ozone, such as nitric oxide.

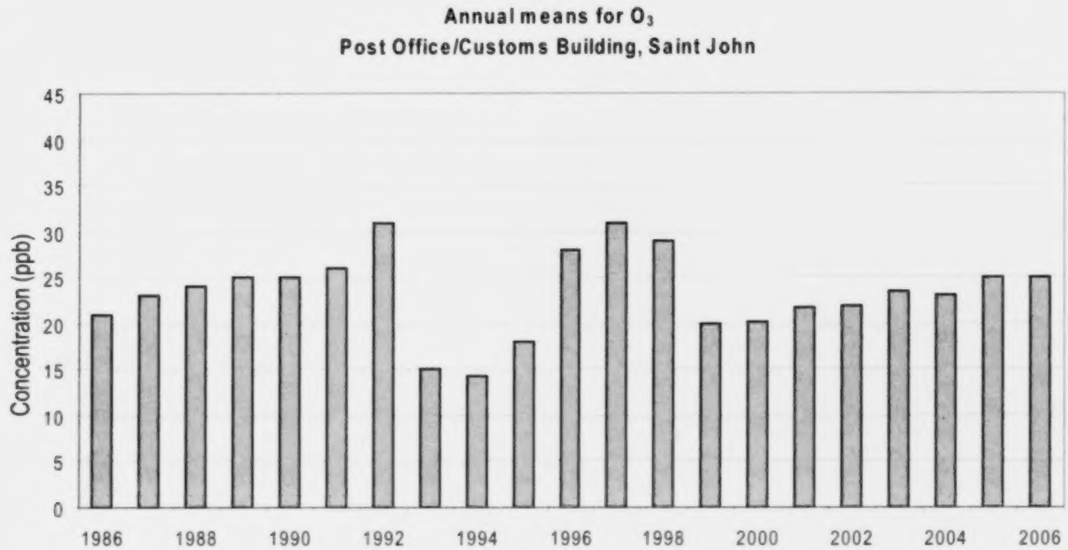


Figure 26. Annual mean ozone at Post Office/Customs Building, 1986-2006.

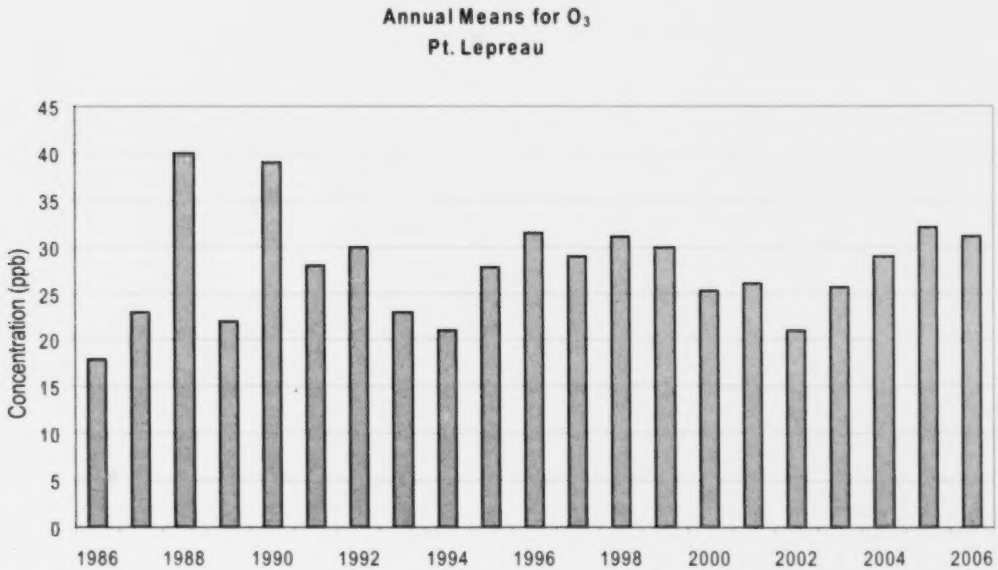


Figure 27. Annual mean ozone at Point Lepreau, 1986-2006.

Provincial ozone trends

Figure 28 shows a composite trend based on all ozone sites in the province. The number of sites has increased substantially over the period of record, from three initially, to 13 in 2000. The latter half of the record is therefore more meaningful. Examining the record since 1986, a linear trend line indicates no change in the province-wide ozone average.

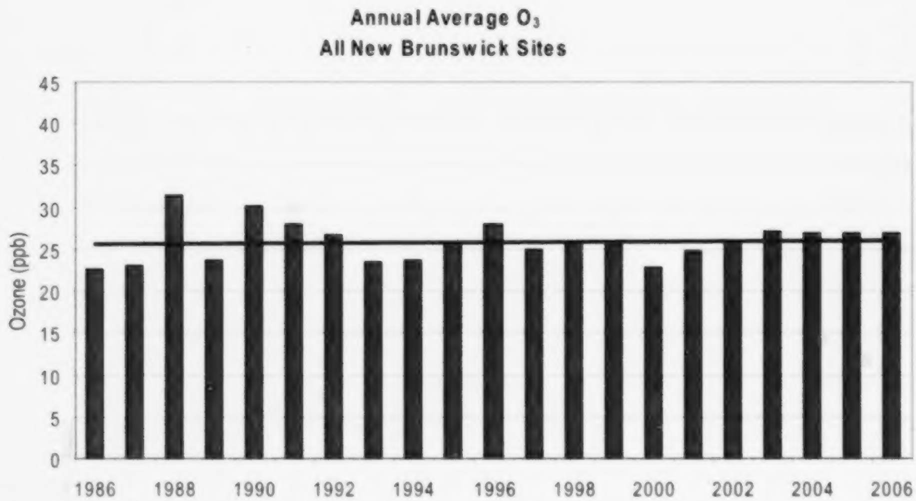


Figure 28. Annual average ozone concentrations based on all New Brunswick sites, 1986-2006.

G. Volatile Organic Compounds

VOCs have been measured at two locations (Forest Hills and Point Lepreau) since 1992, as noted in section 3. Routine analyses provide results for over 150 VOCs. In July 2000, sampling began at Champlain Heights School, a site within 0.5 kilometers of the Irving Oil refinery complex in east Saint John. Trends for selected VOCs are presented in this section.

One clear finding from the VOC sampling program is that concentrations of most VOCs are substantially higher at Forest Hills and Champlain Heights than at Point Lepreau. This is consistent with the location of Forest Hills and Champlain Heigths in an industrial/urban setting and Point Lepreau in a relatively remote, rural setting.

Figure 29 shows trends in average total VOC concentrations for all sites since 1992. These results clearly show the difference in average VOC levels between the three sites. At Forest Hills, total VOC concentrations appear to have decreased in the 3 year period from 2004-2006 in comparison to the previous three year period. There has been relatively little change at Point Lepreau. The VOC trend at Champlain Heights suggests a slight increasing trend since monitoring began in July 2000. Emissions from the refinery complex clearly influence both Forest Hills and Champlain Heights locations.

Compounds such as butane and isopentane (Figure 30), which are major components of gasoline vapour, generally reflected the total VOC trend at the two Saint John sites.

Some potentially toxic VOCs decreased from the early to the late 1990s, and have been more variable since then. Figure 31 shows the trend for benzene, Figure 32 for butadiene and Figure 33 for xylenes.

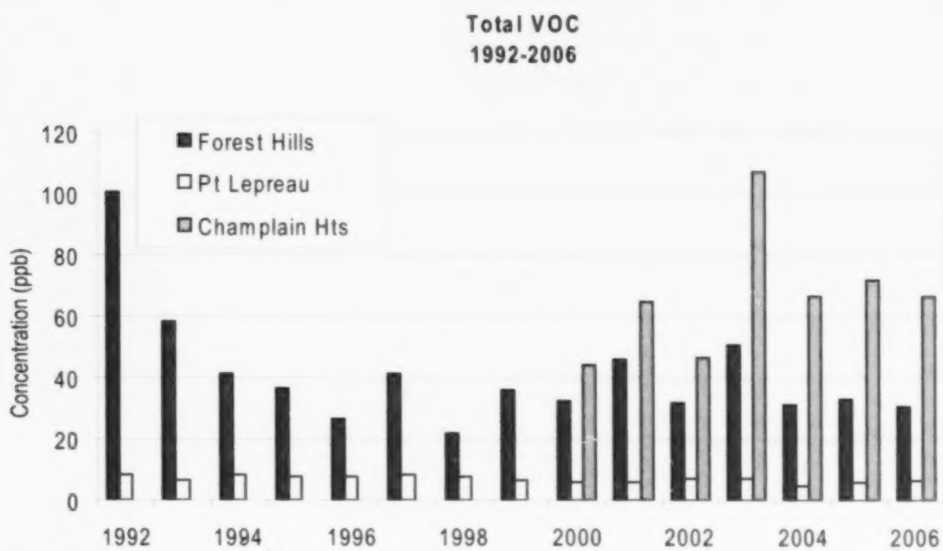


Figure 29. Average total VOC concentration at provincial VOC monitoring sites, 1992-2006.

Benzene is an important component of gasoline. Benzene levels have not changed appreciably in the past 3 years at all sites. However a decrease in average annual concentrations is apparent over the longer term at Forest Hills and Point Lepreau. Benzene concentrations are consistently about 40%-50% higher at Champlain Heights than at Forest Hills.

Butadiene is emitted during petroleum refining and subsequent handling, as well as from internal combustion engines (e.g. CARB, 1992). Butadiene concentrations appear similar at both urban sites and some improvement is apparent since 2000.

Xylenes are associated with vehicle exhaust (Multistakeholder NOx/VOC Science Program, 1997a). As with benzene, a decreasing long term trend is apparent for xylenes at the Forest Hills site. The Champlain Heights' trend suggests little change over a shorter time frame.

The oil refinery began a leak test and repair program in 1995, designed to reduce VOC emissions from leaking equipment such as pumps and valves. This may have been a factor in the observed decreases of many VOCs, although the bulk of the decrease took place between 1992 and 1995. Other changes may have had some influence, such as an increasing proportion of vehicles on the road being equipped with emission control devices. The increasing trend of some VOCs at Champlain Heights may be linked to the overall expansion of the refinery and changes in other VOC emission sources in the area (e.g. other industry in the Grandview industrial park, road traffic and construction traffic).

In Table 27, additional background information is provided on VOCs that are of special concern. These compounds are found on the "priority lists" of many nations, states and provinces, for special attention in term of control programs, including actions such as minimising use, emissions, and human exposure.

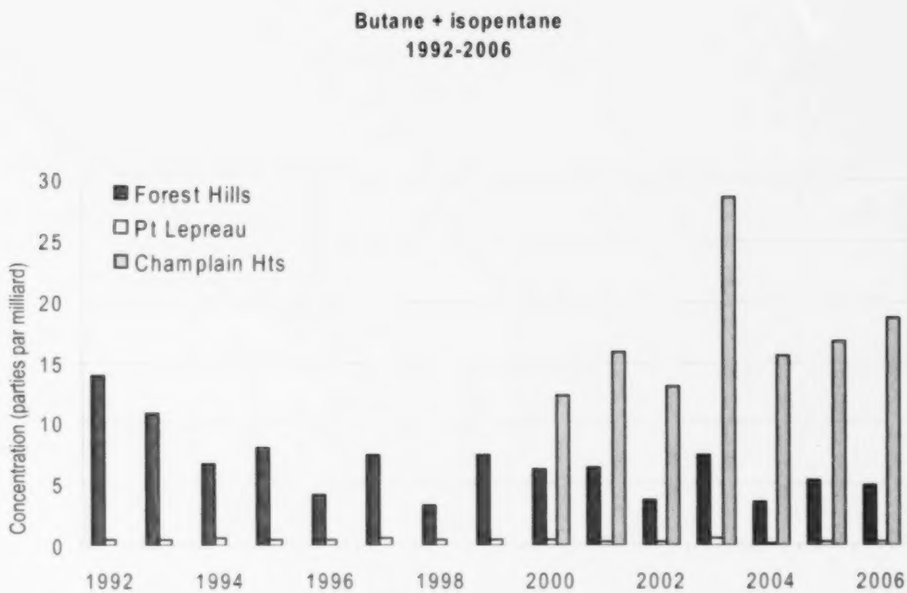


Figure 30. Annual average concentration of butane plus isopentane at provincial VOC monitoring sites, 1992-2006.

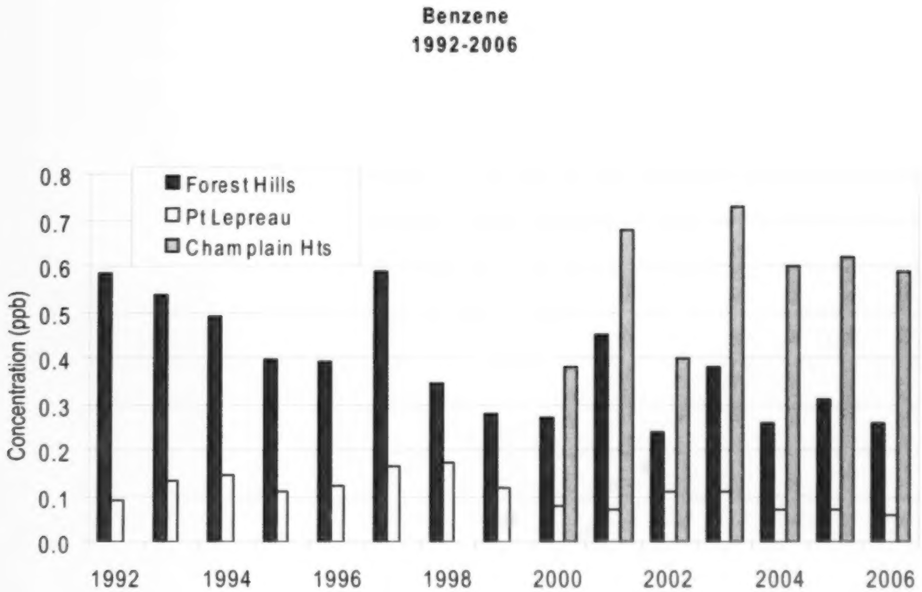


Figure 31. Annual average concentration of benzene at provincial VOC monitoring sites,1992-2006.

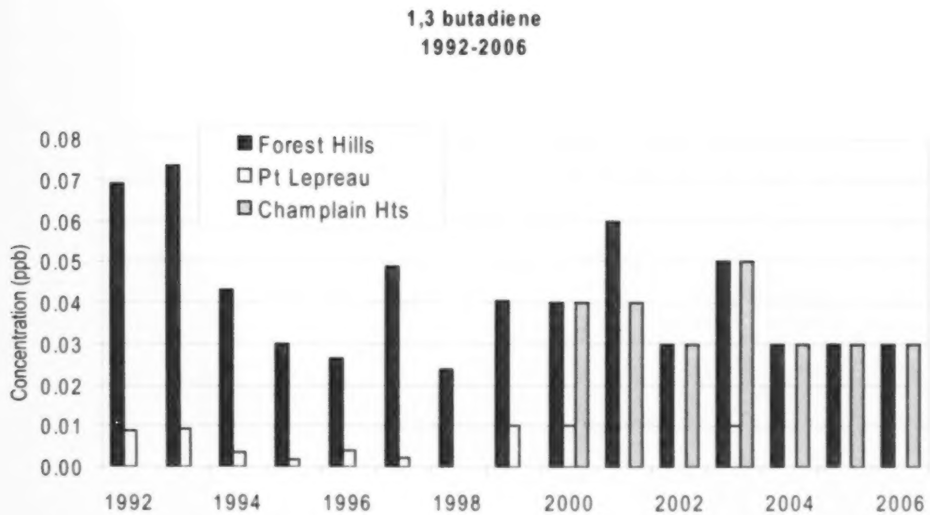


Figure 32. Annual average concentration of 1,3 butadiene at provincial VOC monitoring sites, 1992-2006.

It is apparent that a lot of these compounds have features in common. Many are found in crude oil or are produced as part of the petroleum refining process and they are often used as solvents, or in paint or plastics. Burning is also a potential source of many of these VOCs. Although these compounds have been identified for priority attention, in many cases there is still relatively little information available on their toxicity. In such cases they are often not classifiable in terms of cancer-causing potential, and sufficient detail may not be available to determine if ambient air quality guidelines should be established. For many of the VOCs in this list, technical data sheets note that they may affect the nervous system. In cases where this is known from clinical trials or actual human exposure, it is usually at very high concentrations, much greater than what would be found in the outdoor environment.

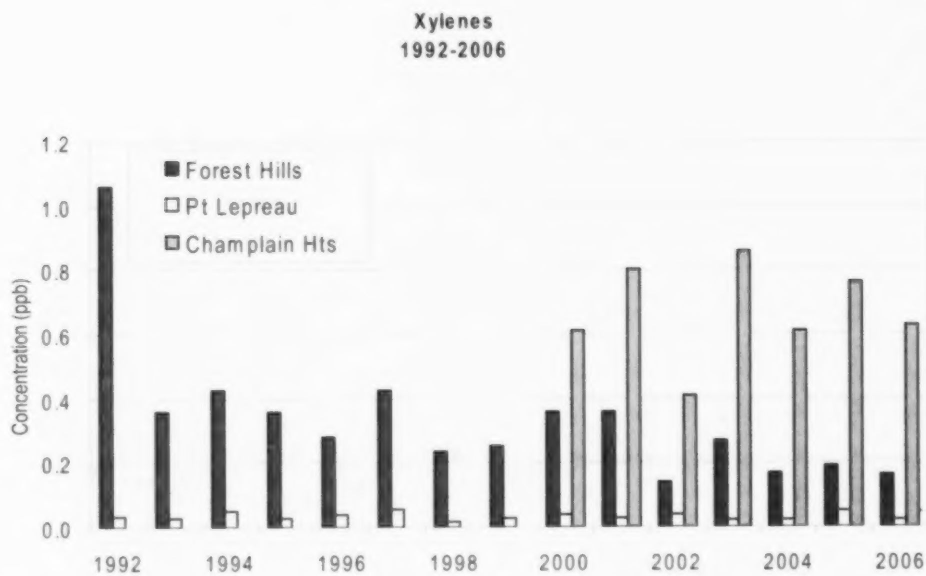


Figure 33. Annual average concentration of xylenes at provincial VOC monitoring sites, 1992-2006.

Table 27. Additional information on VOCs of special concern.

	Cancer-causing	Sources	Other details
1,3 butadiene	Yes (OSHA)	Refining, gasoline, plastics industry, rubber manufacturing, burning.	Most is used to make synthetic rubber.
Benzene	Yes (OSHA, IARC, EPA). Linked with leukaemia.	Refining, gasoline, burning, coal coking.	High-volume industrial compound.
Toluene	No, or unclassifiable (EPA)	Refining, gasoline, solvents.	High levels can affect the nervous system.
Ethylbenzene	No, or unclassifiable (EPA)	Petroleum products, adhesives, paint.	Limited health impact information available.
Xylenes	Insufficient information to classify (EPA, IARC)	Solvents, printing, paint, vehicle exhaust.	High levels can affect the nervous system.
Styrene	Possibly (IARC)	Plastics industry.	High-volume substance used in many products containing plastic or insulation.
Chloromethane	Possibly (EPA)	Burning, natural sources, swimming pools.	High levels can injure the nervous system.
Vinyl chloride	Yes (OSHA). Linked to cancer of liver, brain and lung.	Plastics industry.	No natural sources. Used to make PVC.
1,1 dichloroethylene	Suspected (EPA)	Adhesives and packaging material manufacture.	High levels can cause liver and kidney damage.
Dichloromethane	Probable (EPA), "may cause cancer" (WHO)	Paint stripper, industrial solvent.	No natural sources.
1,2 dichloroethane	Potential (EPA)	Solvent use, plastics and textiles manufacture.	Can cause nervous system disorders and adverse lung, liver and kidney effects.
Carbon tetrachloride	Possibly (IARC), probable (EPA)	Most uses banned. Formerly widely used as a solvent, propellant, and fire extinguishing agent.	No natural sources. Stable from 30-100 years in the atmosphere.
1,2 dichloropropane	Not classifiable (IARC)	Relatively few uses. Chemical intermediate for making other compounds.	No natural sources. High levels may cause organ failure or lung damage.
Trichloroethylene	Probable (IARC)	Paint, solvent use.	No natural sources but persistent in the environment, especially in soils and groundwater.
1,1,2 trichloroethane	Not classifiable (IARC)	Solvent use, and used as a chemical intermediate.	Persistent in groundwater; breaks down slowly in air.
Ethylene dibromide	Potential (EPA)	Pesticide and solvent use. Dye manufacture.	Known to affect the liver, stomach and testes.
Tetrachloroethylene	"May be reasonably anticipated to be" (DHHS)	Dry cleaning, metal degreasing.	High concentrations affect the nervous system.
1,1,2,2, tetrachloroethane	Possible (EPA)	Chemical intermediate.	No longer used as an end product. Previously used as a solvent and in pesticides.
Formaldehyde	Yes (OSHA)	Used in plastics resins, plywood, paper and fertilizers.	Also found in photochemical smog. Can irritate eyes, nose and throat.
Acetaldehyde	Probable (EPA, IARC)	Acetic acid manufacture.	Many uses including as a food additive.
MTBE	Not classified by IARC, EPA or DHHS	Gasoline additive.	Characteristic turpentine-like smell. Contaminates and persists in groundwater.

Notes: EPA = United States Environmental Protection Agency; IARC = International Agency for Research on Cancer; DHHS = US Department of Health and Human Services. Where sources are given, the list provides major examples but is not exhaustive. In most cases there will be additional sources.

9. QUALITY ASSURANCE

The provincial air quality network quality assurance program consists of a number of components, with input and responsibility from both DENV and Environment Canada. Sites managed by DENV are operated according to procedures and methods endorsed by the National Air Pollution Surveillance (NAPS) program, headquartered in Ottawa.

The objective of quality assurance procedures is to provide accurate, representative, comparable, high quality data using consistent operational protocols and standards. The NAPS agency provides calibration, reference standards, and technical support to DENV. Performance audits are also carried out annually. Calibration gases are certified for accuracy and are either "primary reference standards" or are traceable to primary standards maintained by the National Institute of Standards and Technology (NIST) in Maryland.

Instrumentation technologies used in both the provincial and industry networks must satisfy the requirements of the United States Environmental Protection Agency (EPA) as equivalent or reference method for ambient air monitoring. Methods not yet certified by the EPA are used if approved and tested by the NAPS agency.

Quality assurance tasks in the operation of monitoring stations include regular site inspections, instrument response verifications and analyzer calibrations.

Air quality monitoring analysers are specialised instruments, requiring regular maintenance to ensure acceptable operation. In addition, calibration procedures are necessary to ensure accurate results are obtained. For instruments measuring pollutants in gas form, calibration involves introducing known concentrations of the pollutant gas to the analyser, and monitoring the response. Three or four concentration values are used when performing such a "multipoint" calibration. Certified flow, temperature and pressure standards are used for equipment which measures particulate matter.

Audits of sites operated by DENV are performed by Environment Canada on randomly selected sites within the provincial network. An interlaboratory testing program is also conducted annually. This consists of the analysis of gases supplied "blind" (i.e. with no information on the true concentration) by the NAPS laboratory. DENV technicians analyze the blind test gas using their calibration equipment and send the results to NAPS, who return a report on performance to the province. This serves to standardize the performance of calibration systems within the province and across the country.

Performance and system/operator audits are carried out by DENV every two years to ensure acceptable data quality. Industry network audits are performed every one or two years, using NAPS certified standards (see the following section).

After data have been acquired, they are all validated. This involves examining results, taking into account instrument records, especially "zero and span drift" (measures of internal instrument changes), other site records, maintenance procedures, calibration of the analyzers, adjustments made to operating settings, performance and history of the analyzers, seasonal conditions, and changes and levels of other pollutants during a given time frame.

Audits of Industry-operated sites

To ensure data quality, DENV technicians visit the monitoring sites operated by industries in New Brunswick, and perform independent site audits. It is normal to check all operating analysers at least once per year, or more often if required. Audits help identify and solve problems, prevent problems from developing, and assure data quality within the provincial monitoring system.

Results of air quality monitoring audits in 2006 are summarised in Table 28. A total of 27 instrument audits were carried out in 2006.

Table 28. Air quality site audits, 2006.

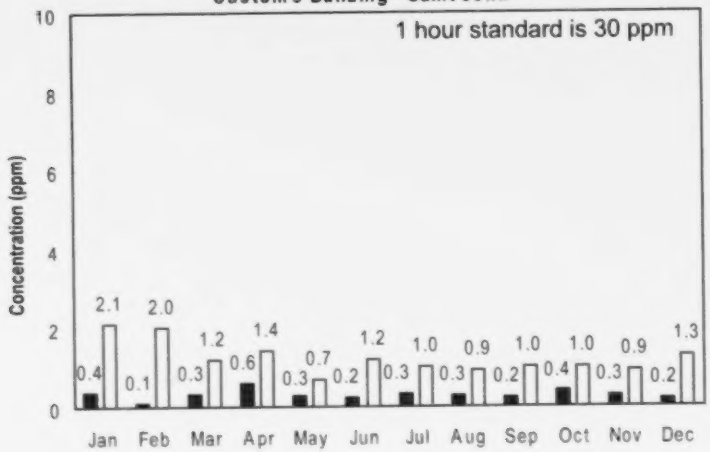
Industry	Site	Parameter	Date	Absolute difference from standard (%)	Pass/fail
AV cell	Boom Rd.	SO_2	Nov 7 06	2.0	P
	Dairy Queen	SO_2	Nov 7 06	2.0	P
St-Anne Nackawic	Caverhill Rd	TRS	Dec 18 06	2.0	P
	Caverhill Rd	SO_2	Dec 18 06	3.0	P
NB Power Belledune	Municipal site	NOX	Nov 21 06	15	P
		SO_2	Nov 21 06	0.3	P
		BAM $PM_{2.5}$	June 20 06	5.0	P
	Belledune East	NOX	Nov 21 06	4.0	P
		SO_2	Nov 21 06	4.5	P
		BAM $PM_{2.5}$	June 20 06	2.0	P
	Jacquet River	SO_2	Nov 21 06	4.0	P
	Madran	SO_2	Nov 22 06	4.0	P
	Pointe Verte	SO_2	Nov 22 06	8.0	P
NB Power Grand Lake	Flowers Cove	SO_2	Nov 29 06	19.0	F (Note 1)
	Newcastle Centre	SO_2	Nov 29 06	6.0	P
	Cox's Point	SO_2	Nov 30 06	1.0	P
	Bailey's Point	SO_2	Nov 30 06	1.5	P
NB Power Colson Cove	Manawagonish Rd.	SO_2	Dec 13 06	2.4	P
		BAM $PM_{2.5}$	Dec 13 06	2.0	P
	Lorneville	SO_2	Dec 13 06	3	P
		BAM $PM_{2.5}$	Dec 13 06	5	P
Lake Utopia Paper	Mobile site	SO_2	Feb 20 06	6.0	P
Xstrata	Chalmers site	SO_2	Nov 8 06	na	na (Note 2)
	Boulay Farm	SO_2	Nov 8 06	2.0	P
	Town site	SO_2	Nov 8 06	2.5	P
Weyerhaeuser Miramichi	Hay Lane site	BAM $PM_{2.5}$	June 21 06	1.0	P
	Fire Pond site	BAM $PM_{2.5}$	June 21 06	1.5	P

Note 1: Instrument malfunctioning; replaced December 2006
Note 2: Instrument out of service

APPENDIX I:
DETAILED MONTHLY MONITORING RESULTS FOR 2006

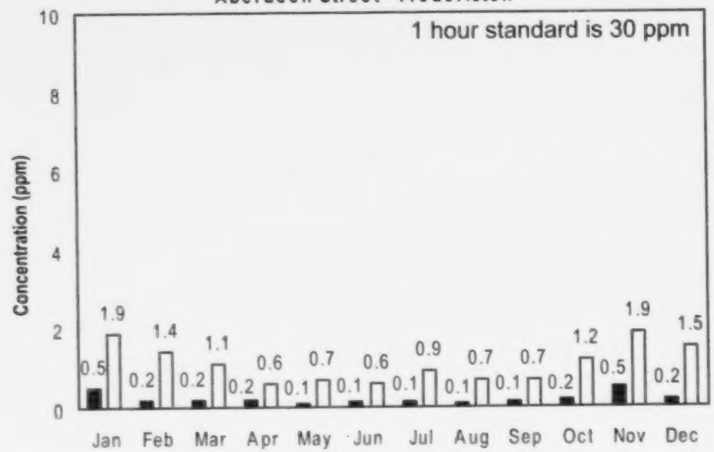
Monthly average and maximum 1 hour values of Carbon Monoxide in 2006

Customs Building - Saint John



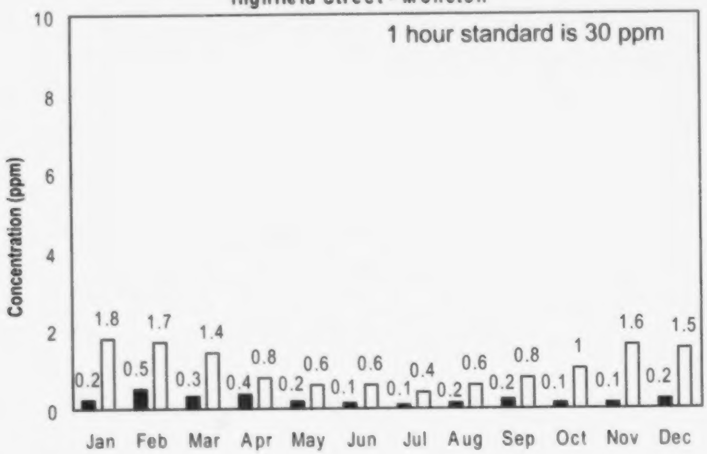
Monthly average and maximum 1 hour values of Carbon Monoxide in 2006

Aberdeen Street - Fredericton



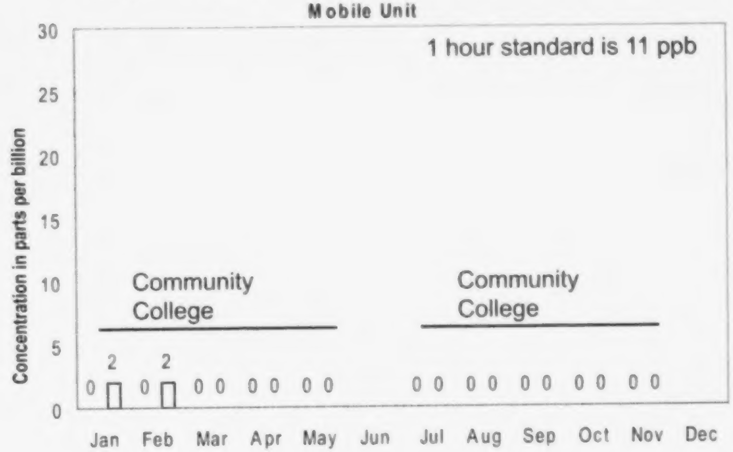
Monthly average and maximum 1 hour values of Carbon Monoxide in 2006

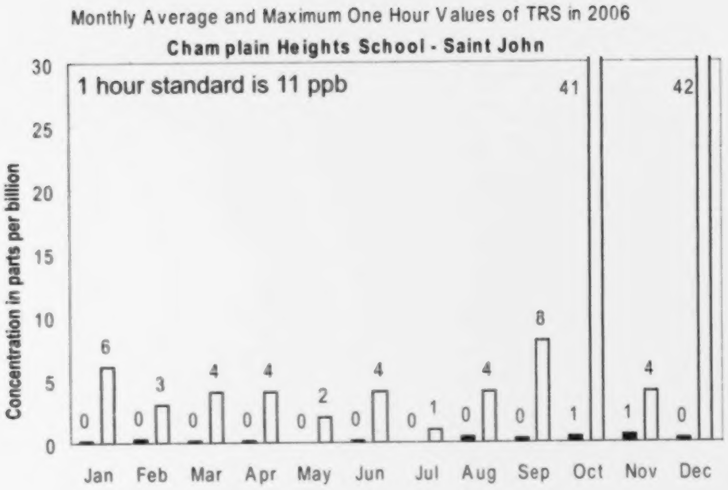
Highfield Street - Moncton

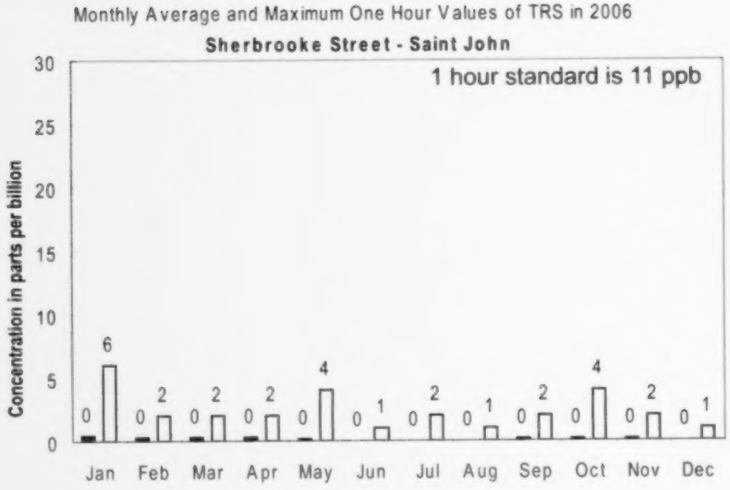


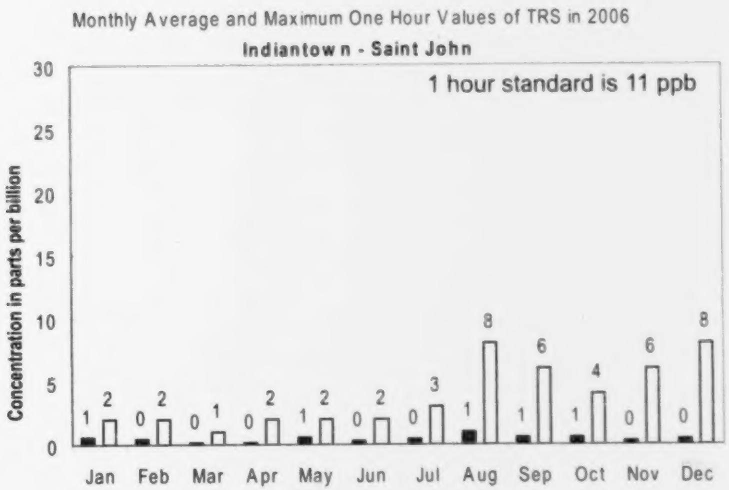
Monthly Average and Maximum One Hour Values of TRS in 2006

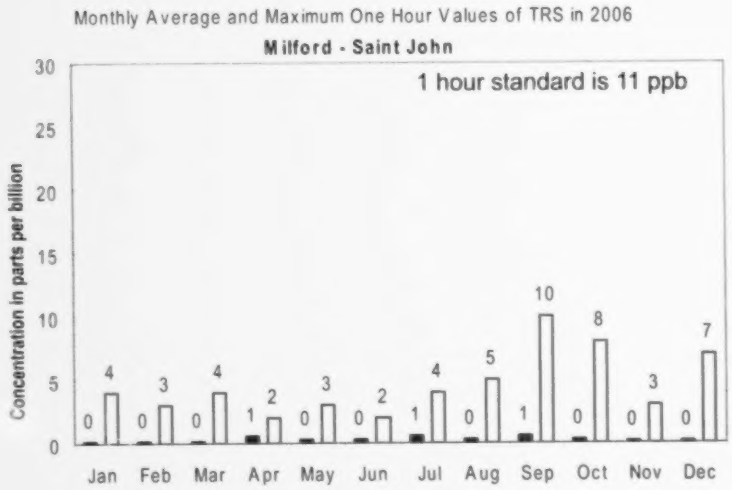
Mobile Unit

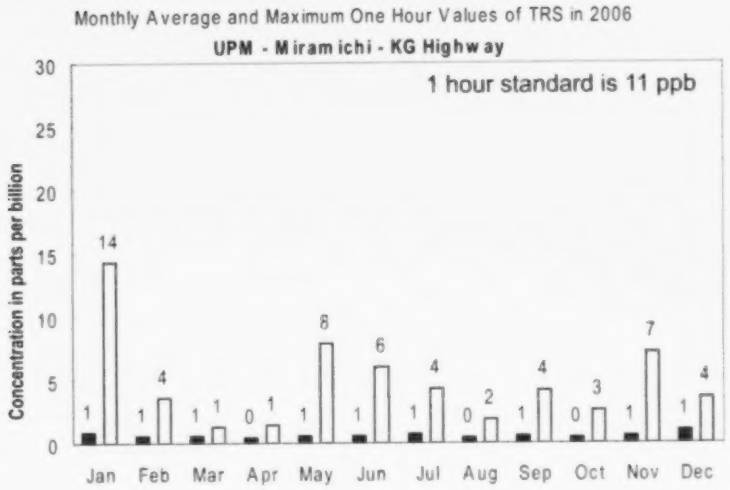


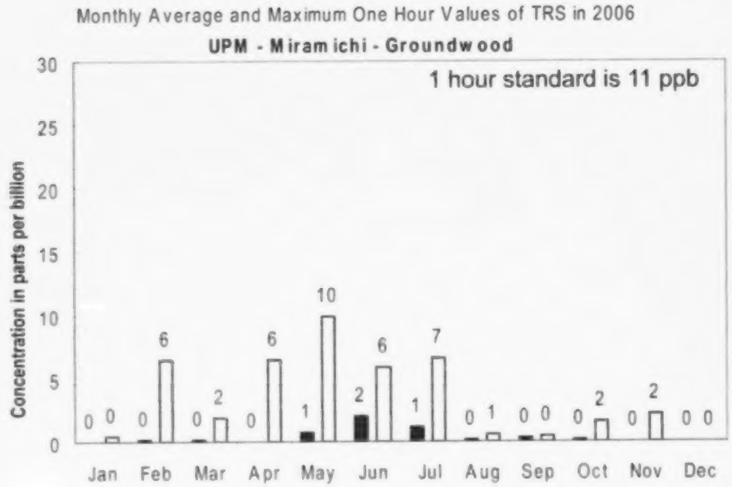

Monthly Average and Maximum One Hour Values of TRS in 2006
Champlain Heights School - Saint John
1 hour standard is 11 ppb
Concentration in parts per billion
0 5 10 15 20 25 30
6 3 4 4 2 4 1 4 8 41 4 42
0 0 0 0 0 0 0 0 0 1 1 0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

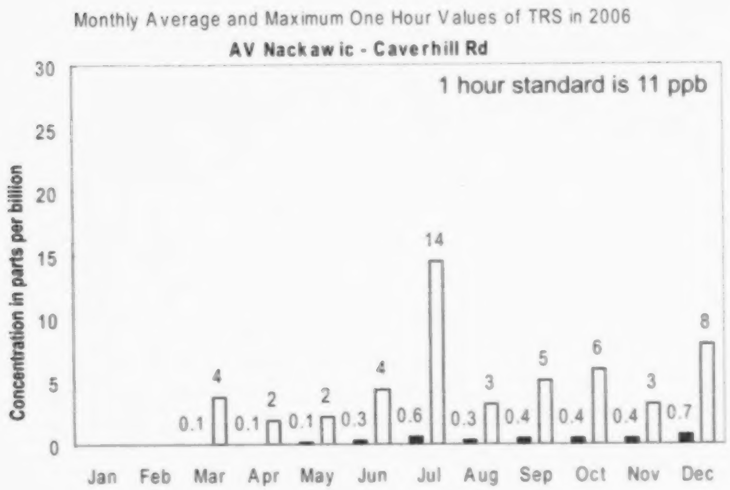

Monthly Average and Maximum One Hour Values of TRS in 2006
Sherbrooke Street - Saint John
1 hour standard is 11 ppb
Concentration in parts per billion
0 5 10 15 20 25 30
6 2 2 2 4 1 2 1 2 4 2 1
0 0 0 0 0 0 0 0 0 0 0 0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

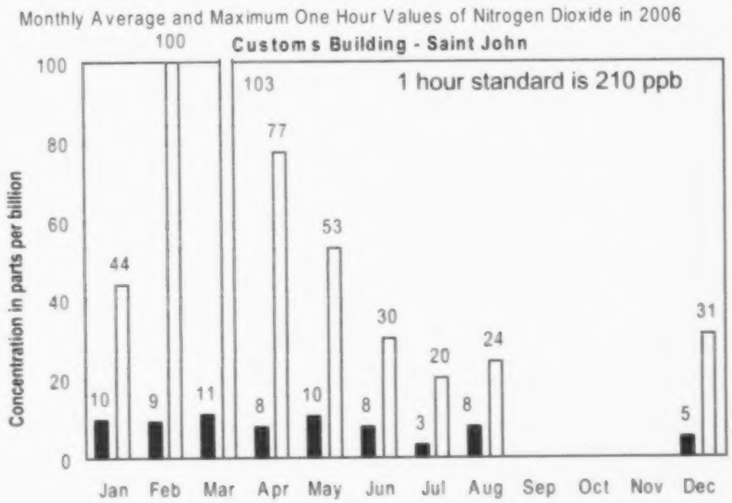

Monthly Average and Maximum One Hour Values of TRS in 2006
Indiantown - Saint John
1 hour standard is 11 ppb
Concentration in parts per billion
0 5 10 15 20 25 30
2 2 1 2 2 2 3 8 6 4 6 8
1 0 0 0 1 0 0 1 1 1 0 0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

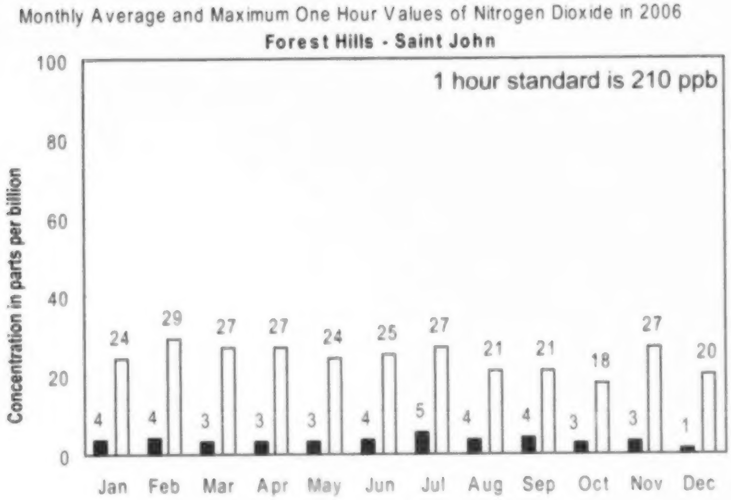

Monthly Average and Maximum One Hour Values of TRS in 2006
Milford - Saint John
1 hour standard is 11 ppb
Concentration in parts per billion
0 5 10 15 20 25 30
4 3 4 2 3 2 4 5 10 8 3 7
0 0 0 1 0 0 1 0 1 0 0 0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

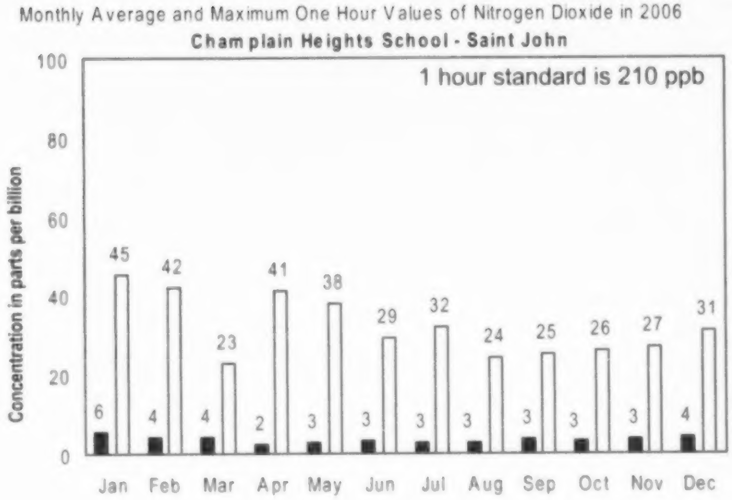

Monthly Average and Maximum One Hour Values of TRS in 2006
UPM - Miramichi - KG Highway
1 hour standard is 11 ppb
Concentration in parts per billion
30
25
20
15
10
5
0
1 14
1 4
1 1
0 1
1 8
1 6
1 4
0 2
1 4
0 3
1 7
1 4
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

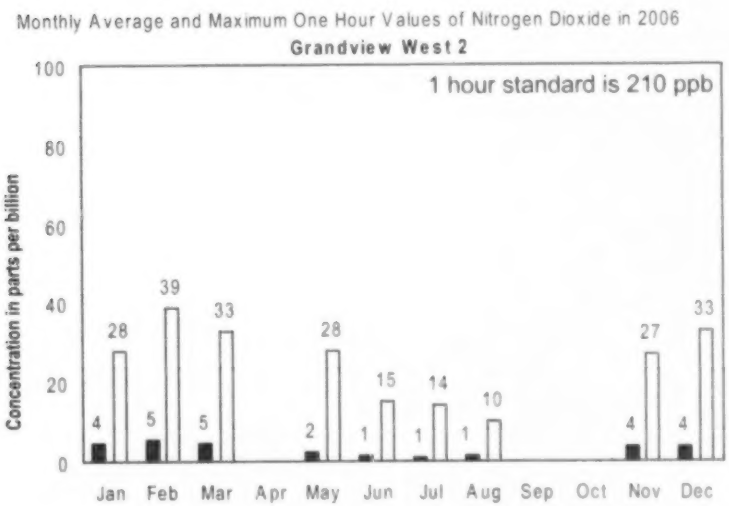

Monthly Average and Maximum One Hour Values of TRS in 2006
UPM - Miramichi - Groundwood
1 hour standard is 11 ppb
Concentration in parts per billion
30
25
20
15
10
5
0
0 0
0 6
0 2
0 6
1 10
2 6
1 7
0 1
0 0
0 2
0 2
0 0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

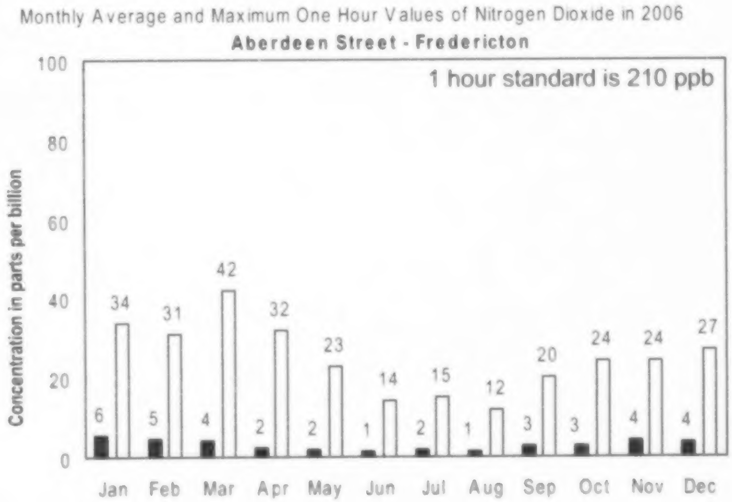

Monthly Average and Maximum One Hour Values of TRS in 2006
AV Nackawic - Caverhill Rd
1 hour standard is 11 ppb
Concentration in parts per billion
30
25
20
15
10
5
0
0.1 4
0.1 2
0.1 2
0.3 4
0.6 14
0.3 3
0.4 5
0.4 6
0.4 3
0.7 8
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2006
Customs Building - Saint John
1 hour standard is 210 ppb
Concentration in parts per billion
100
80
60
40
20
0
10 44
9 100
11 103
8 77
10 53
8 30
3 20
8 24
5 31
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

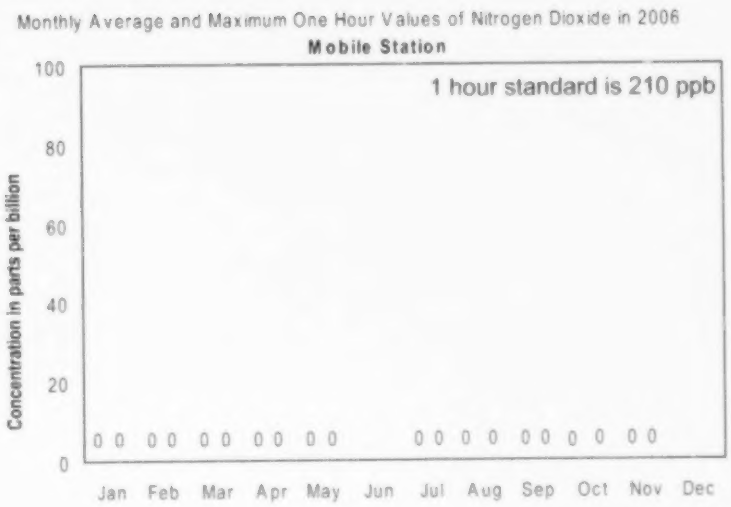

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2006
Forest Hills - Saint John
1 hour standard is 210 ppb
Concentration in parts per billion
100
80
60
40
20
0
4
24
4
29
3
27
3
27
3
24
4
25
5
27
4
21
4
21
3
18
3
27
1
20
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

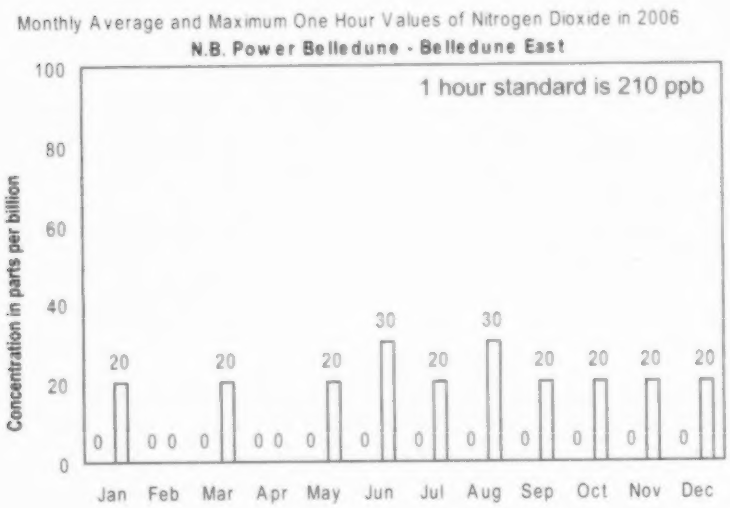

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2006
Champlain Heights School - Saint John
1 hour standard is 210 ppb
Concentration in parts per billion
100
80
60
40
20
0
6
45
4
42
4
23
2
41
3
38
3
29
3
32
3
24
3
25
3
26
3
27
4
31
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

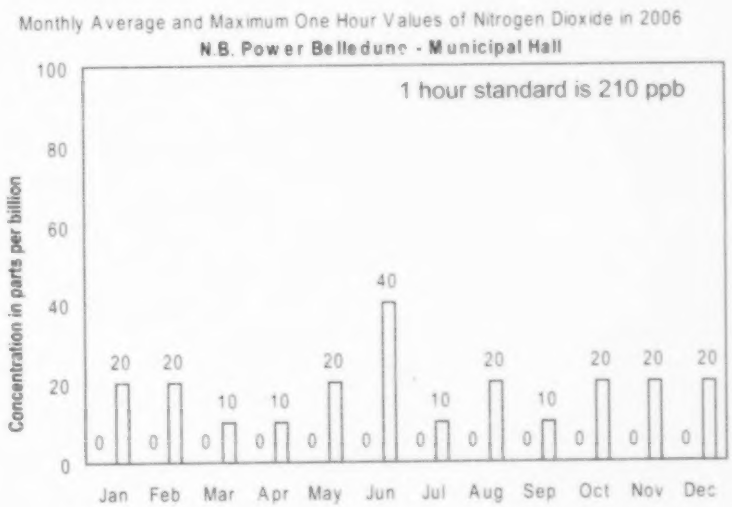

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2006
Grandview West 2
1 hour standard is 210 ppb
Concentration in parts per billion
100
80
60
40
20
0
4
28
5
39
5
33
2
28
1
15
1
14
1
10
4
27
4
33
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

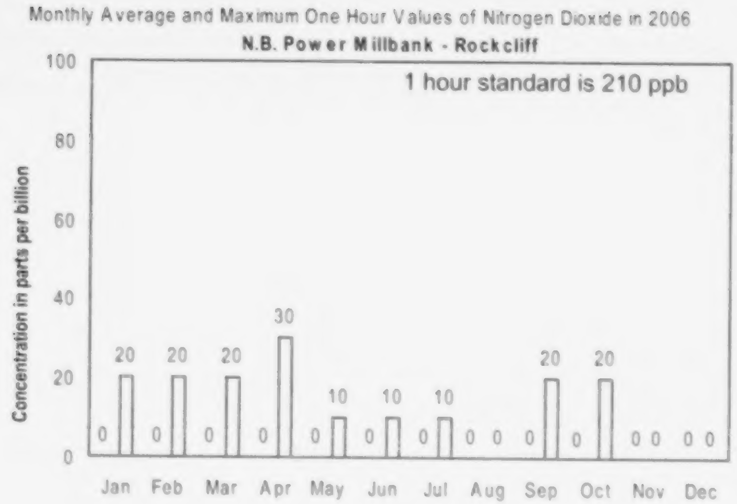

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2006
Aberdeen Street - Fredericton
1 hour standard is 210 ppb
Concentration in parts per billion
100
80
60
40
20
0
6
34
5
31
4
42
2
32
2
23
1
14
2
15
1
12
3
20
3
24
4
24
4
27
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

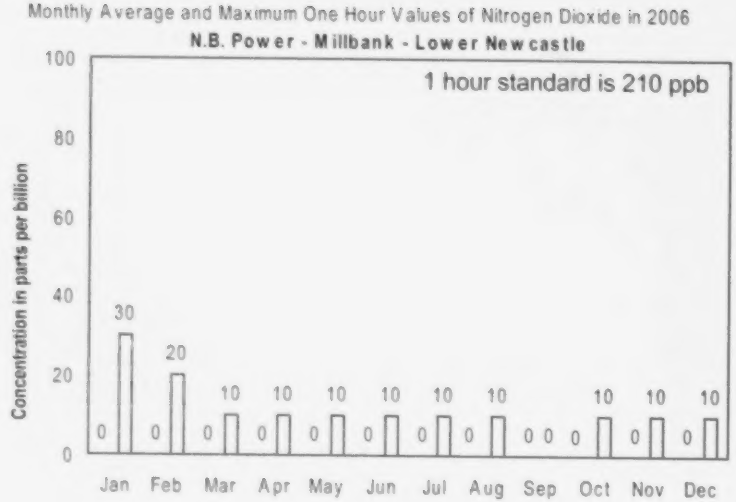

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2006
Highfield Street - Moncton
1 hour standard is 210 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
6 15 9 41 7 30 5 23 3 23 3 23 2 15 3 18 4 24 5 25 5 32

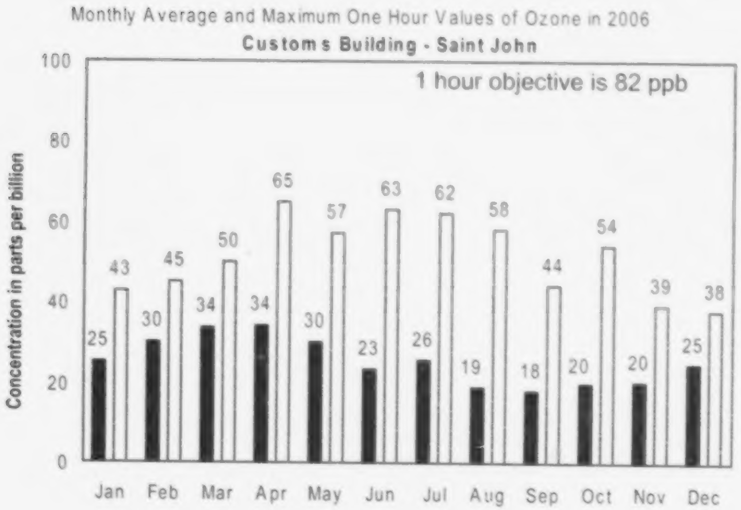

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2006
Mobile Station
1 hour standard is 210 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

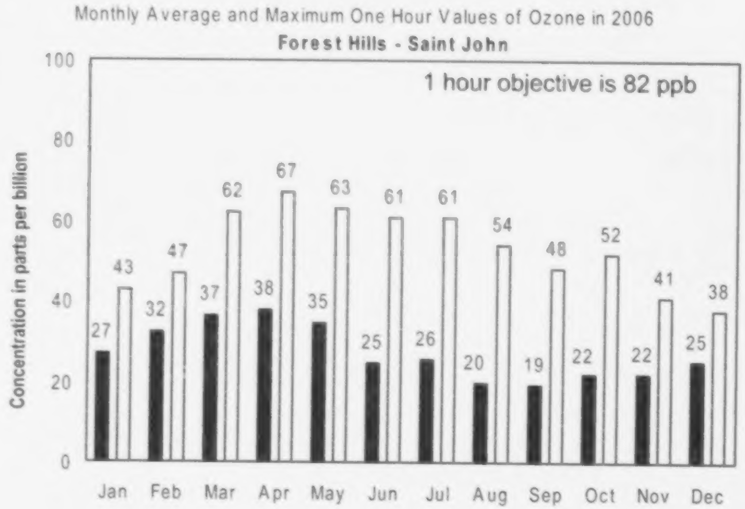

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2006
N.B. Power Belledune - Belledune East
1 hour standard is 210 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2006
N.B. Power Belledune - Municipal Hall
1 hour standard is 210 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

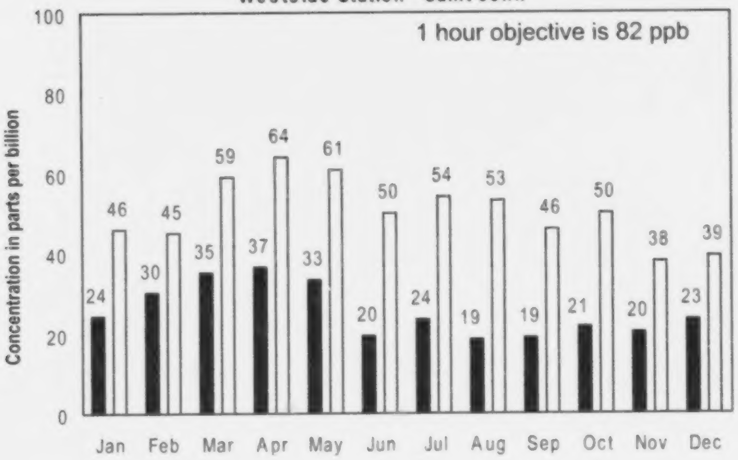

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2006
N.B. Power Millbank - Rockcliff
1 hour standard is 210 ppb
Concentration in parts per billion
0
20
40
60
80
100
0 20 0 20 0 20 0 30 0 10 0 10 0 10 0 0 0 20 0 20 0 0 0 0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2006
N.B. Power - Millbank - Lower Newcastle
1 hour standard is 210 ppb
Concentration in parts per billion
0
20
40
60
80
100
0 30 0 20 0 10 0 10 0 10 0 10 0 10 0 10 0 0 0 10 0 10 0 10
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

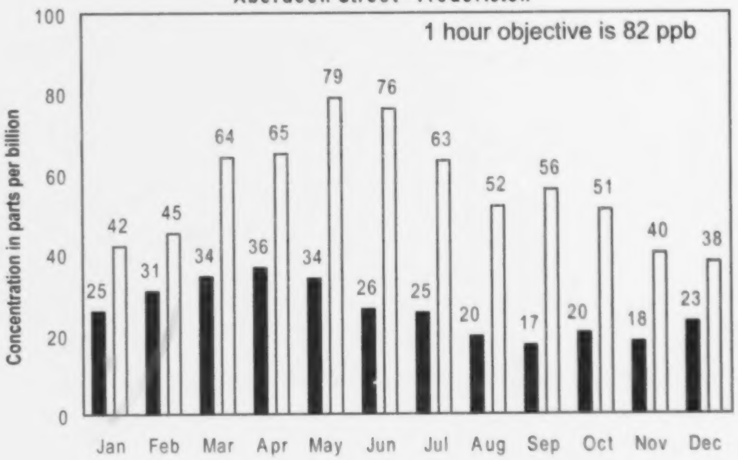

Monthly Average and Maximum One Hour Values of Ozone in 2006
Customs Building - Saint John
1 hour objective is 82 ppb
Concentration in parts per billion
0
20
40
60
80
100
25 43 30 45 34 50 34 65 30 57 23 63 26 62 19 58 18 44 20 54 20 39 25 38
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average and Maximum One Hour Values of Ozone in 2006
Forest Hills - Saint John
1 hour objective is 82 ppb
Concentration in parts per billion
0
20
40
60
80
100
27 43 32 47 37 62 38 67 35 63 25 61 26 61 20 54 19 48 22 52 22 41 25 38
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

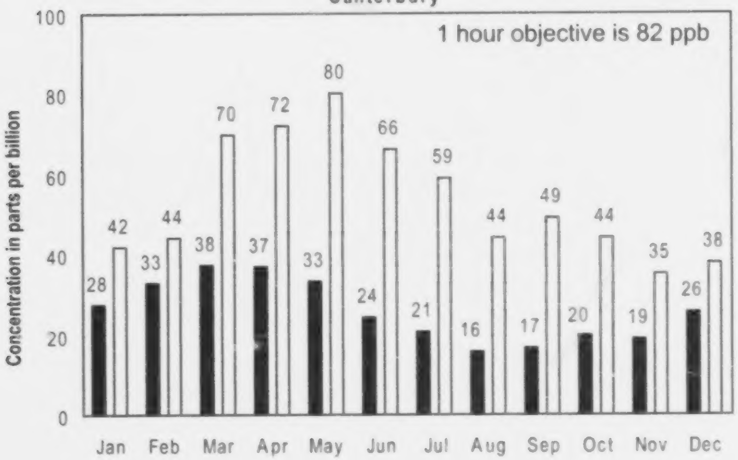
Monthly Average and Maximum One Hour Values of Ozone in 2006
Westside Station - Saint John



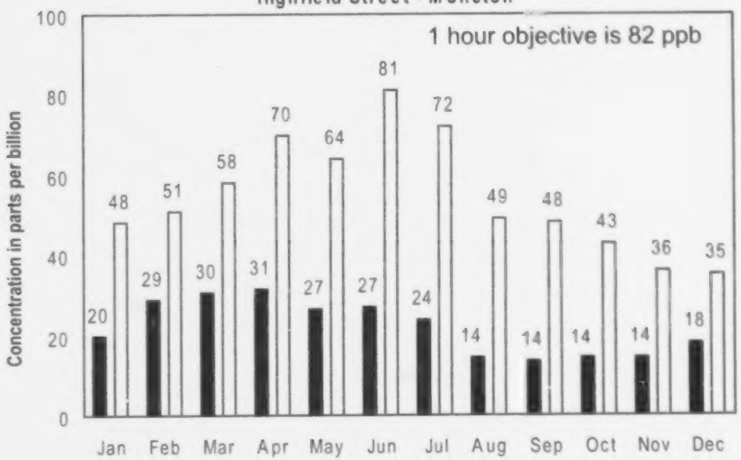
Monthly Average and Maximum One Hour Values of Ozone in 2006
Aberdeen Street - Fredericton



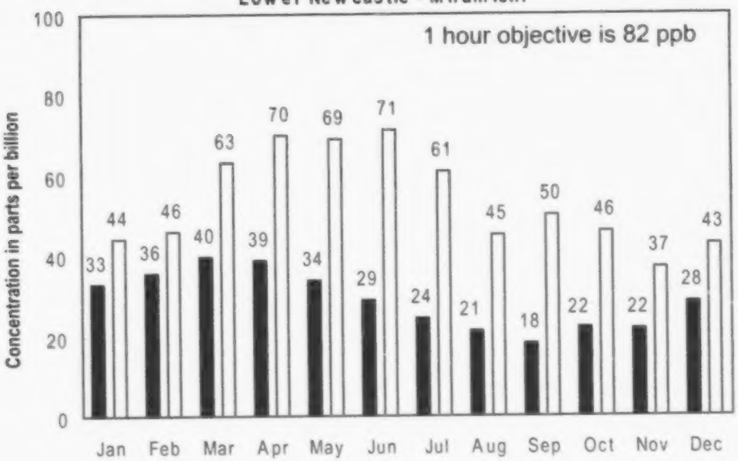
Monthly Average and Maximum One Hour Values of Ozone in 2006
Canterbury



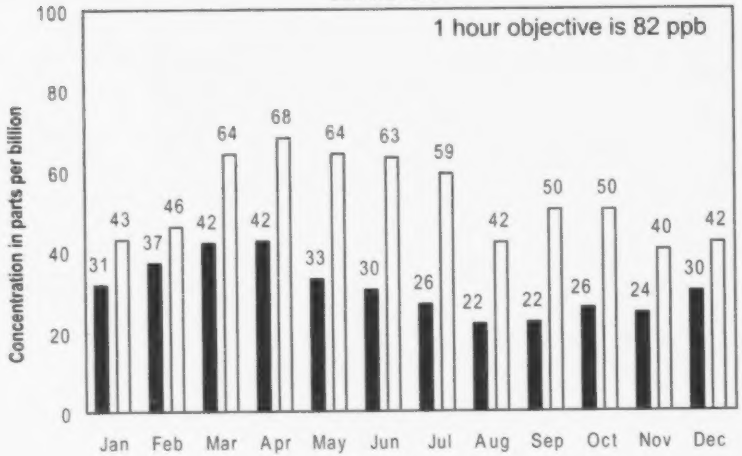
Monthly Average and Maximum One Hour Values of Ozone in 2006
Highfield Street - Moncton



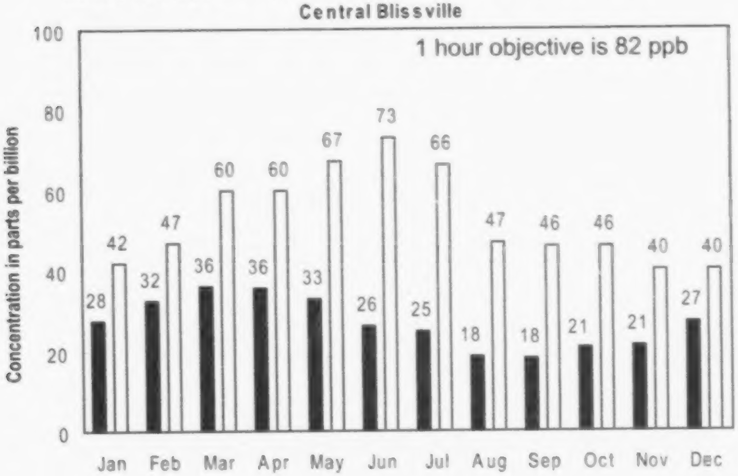
Monthly Average and Maximum One-Hour Values of Ozone in 2006
Lower Newcastle - Miramichi



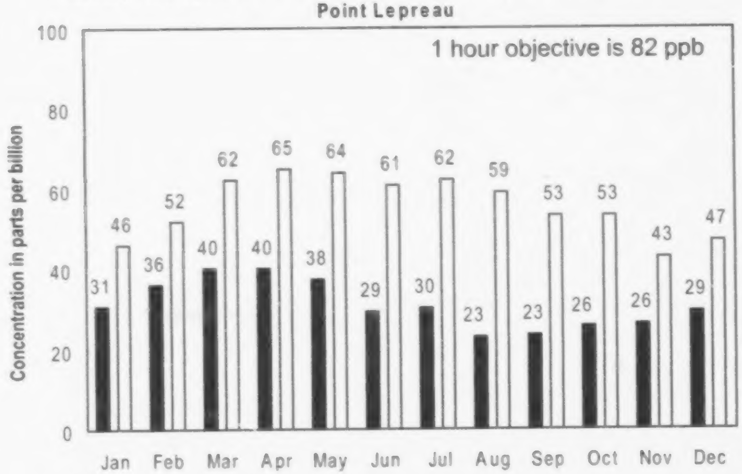
Monthly Average and Maximum One Hour Values of Ozone in 2006
St. Leonard

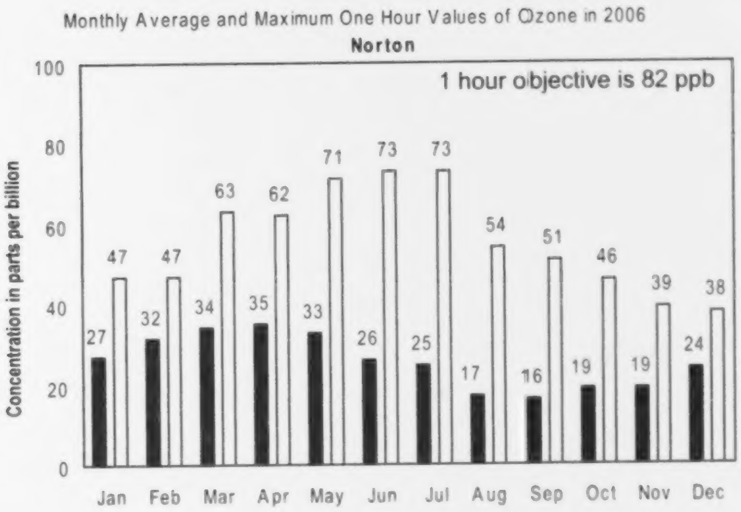


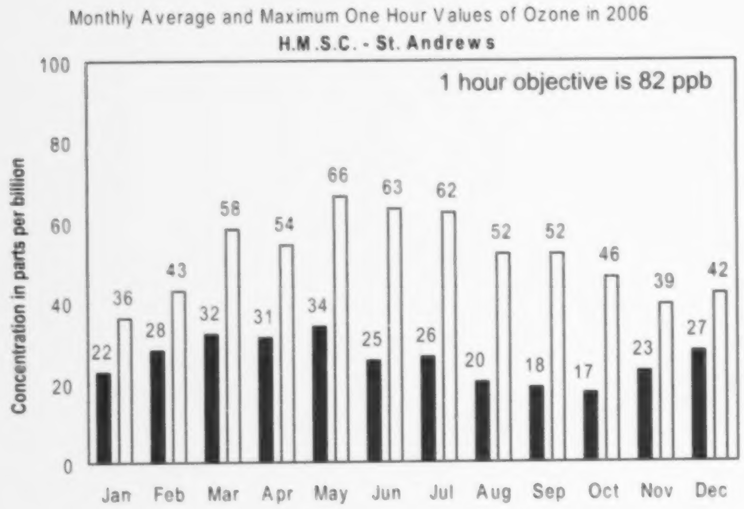
Monthly Average and Maximum One Hour Values of Ozone in 2006
Central Blissville

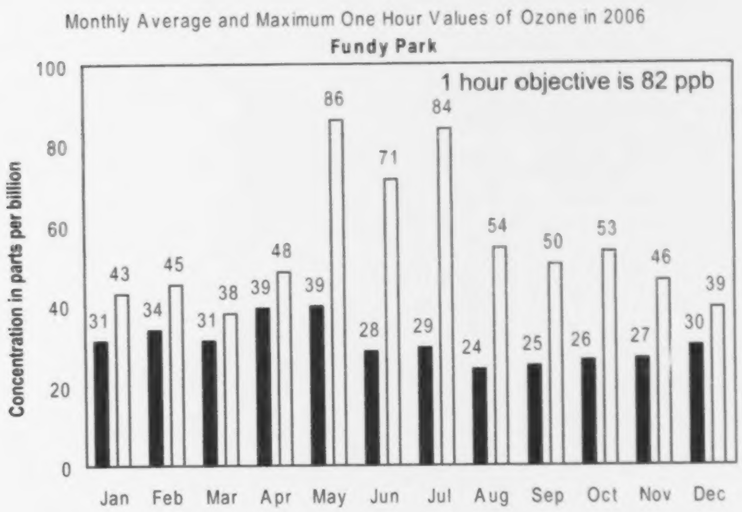


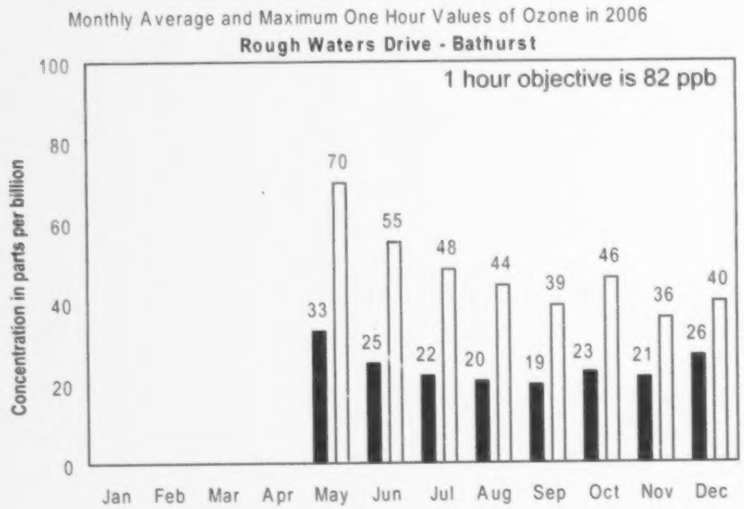
Monthly Average and Maximum One Hour Values of Ozone in 2006
Point Lepreau

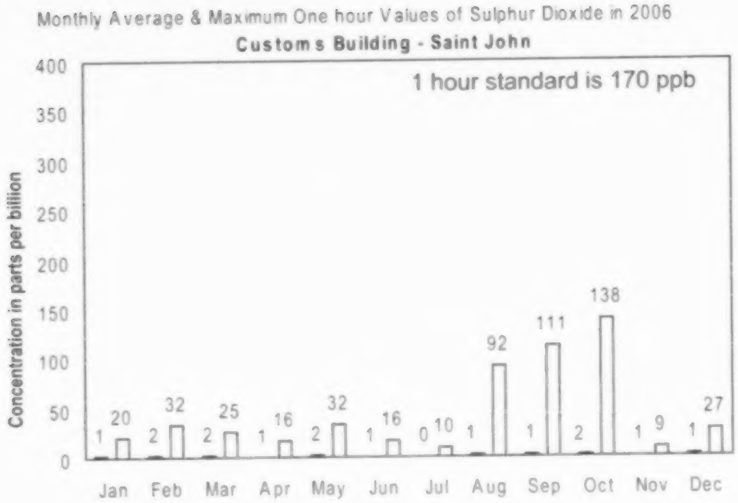


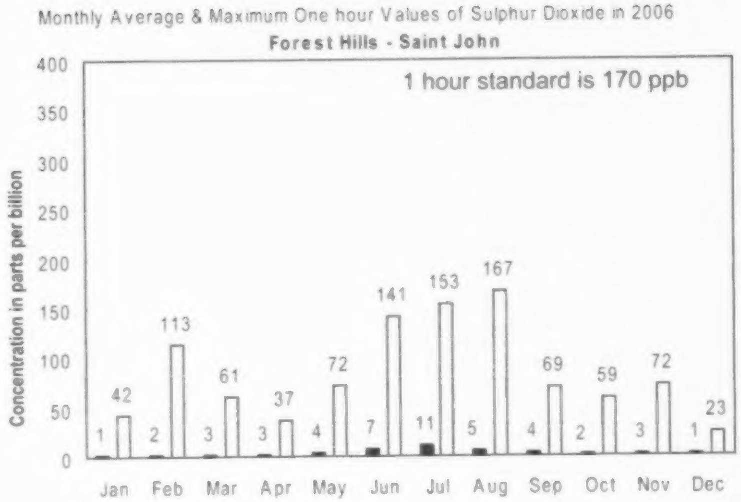

Monthly Average and Maximum One Hour Values of Ozone in 2006
Norton
1 hour objective is 82 ppb
Concentration in parts per billion
100
80
60
40
20
0
47
47
63
62
71
73
73
54
51
46
39
38
27
32
34
35
33
26
25
17
16
19
19
24
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

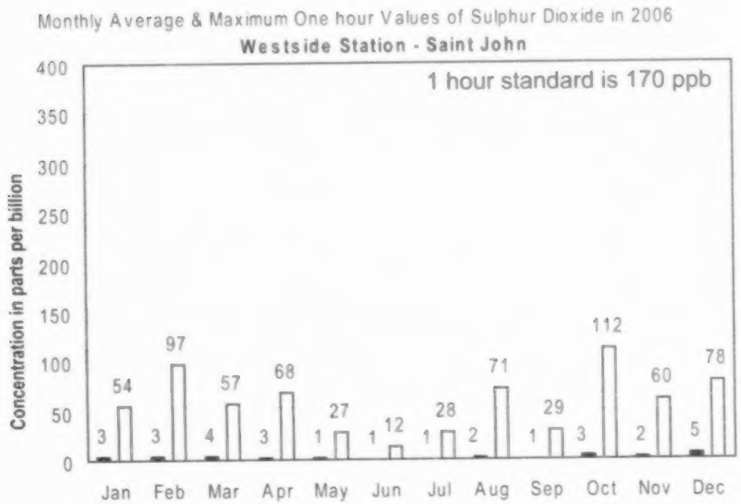

Monthly Average and Maximum One Hour Values of Ozone in 2006
H.M.S.C. - St. Andrews
1 hour objective is 82 ppb
Concentration in parts per billion
100
80
60
40
20
0
36
43
58
54
66
63
62
52
52
46
39
42
22
28
32
31
34
25
26
20
18
17
23
27
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

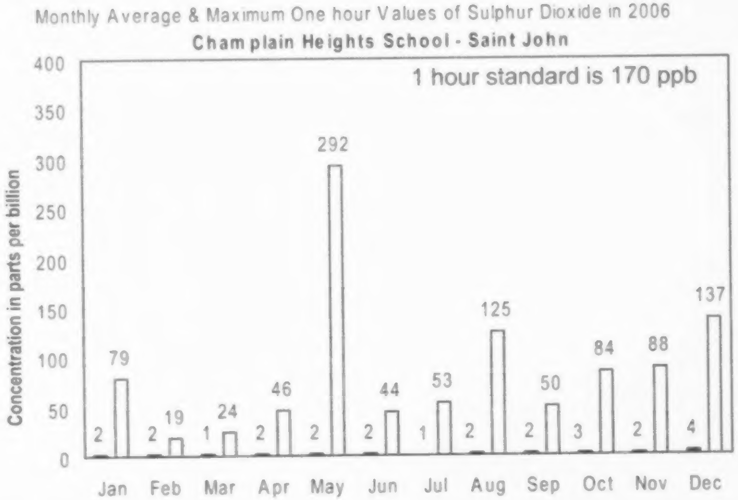

Monthly Average and Maximum One Hour Values of Ozone in 2006
Fundy Park
1 hour objective is 82 ppb
Concentration in parts per billion
100
80
60
40
20
0
43
45
38
48
86
71
84
54
50
53
46
39
31
34
31
39
39
28
29
24
25
26
27
30
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

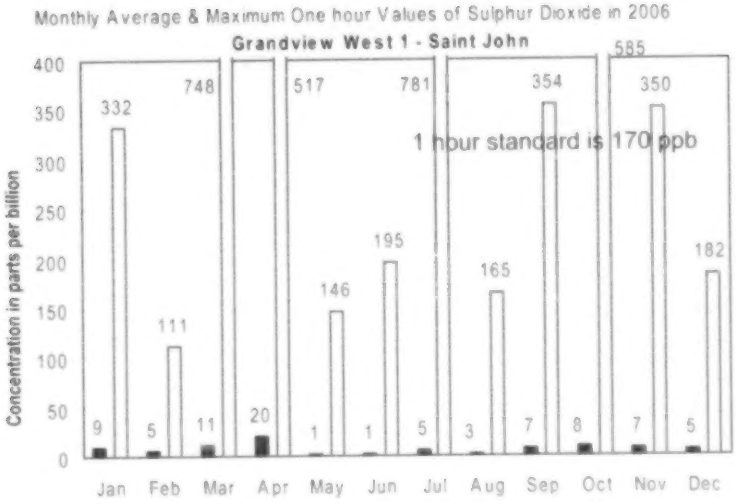

Monthly Average and Maximum One Hour Values of Ozone in 2006
Rough Waters Drive - Bathurst
1 hour objective is 82 ppb
Concentration in parts per billion
100
80
60
40
20
0
70
55
48
44
39
46
36
40
33
25
22
20
19
23
21
26
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

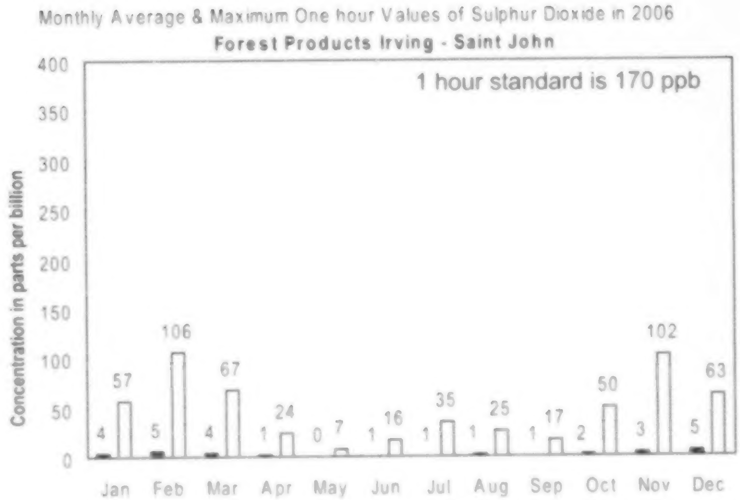

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
Customs Building - Saint John
1 hour standard is 170 ppb
Concentration in parts per billion
0
50
100
150
200
250
300
350
400
1 20 2 32 2 25 1 16 2 32 1 16 0 10 1 92 1 111 2 138 1 9 1 27
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

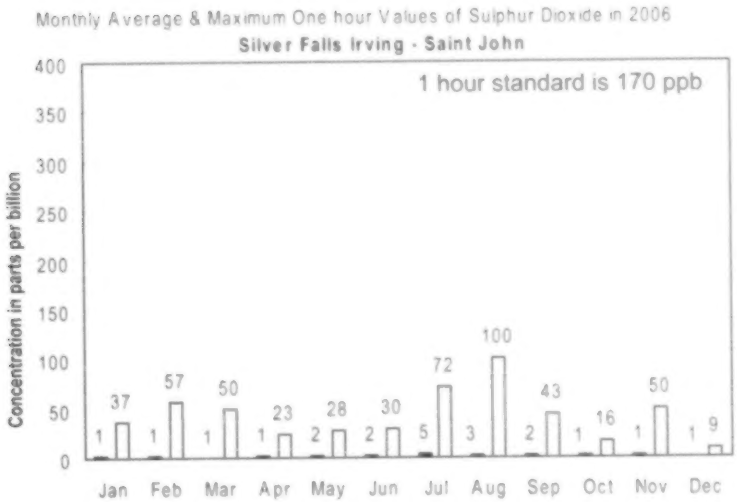

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
Forest Hills - Saint John
1 hour standard is 170 ppb
Concentration in parts per billion
0
50
100
150
200
250
300
350
400
1 42 2 113 3 61 3 37 4 72 7 141 11 153 5 167 4 69 2 59 3 72 1 23
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

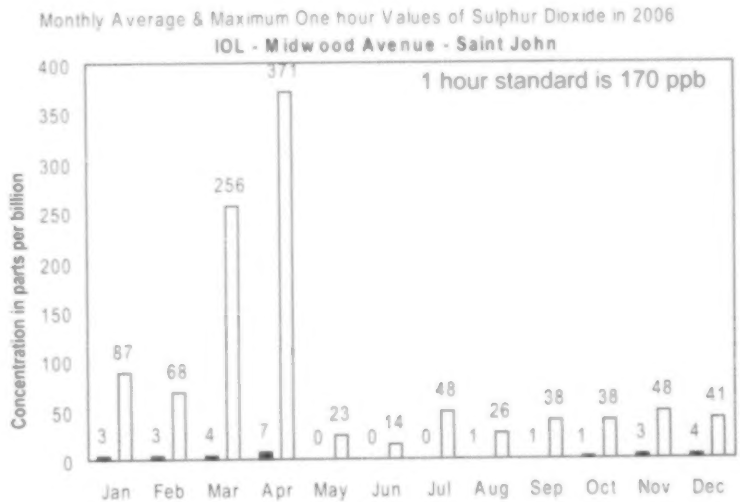

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
Westside Station - Saint John
1 hour standard is 170 ppb
Concentration in parts per billion
0
50
100
150
200
250
300
350
400
3 54 3 97 4 57 3 68 1 27 1 12 1 28 2 71 1 29 3 112 2 60 5 78
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

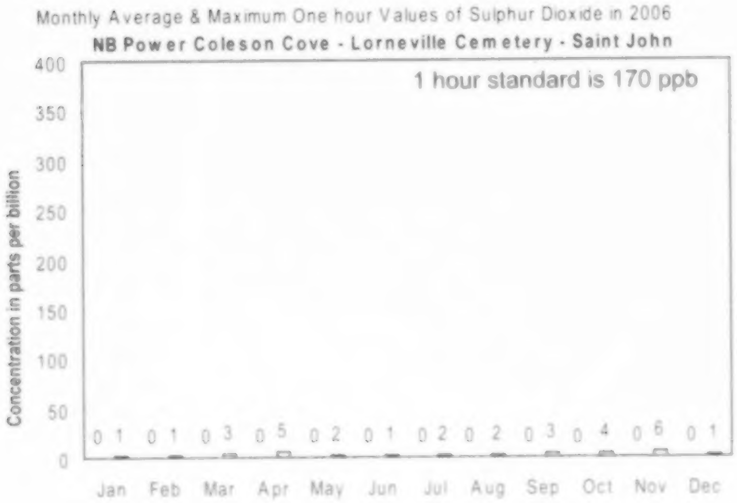

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
Champlain Heights School - Saint John
1 hour standard is 170 ppb
Concentration in parts per billion
0
50
100
150
200
250
300
350
400
2 79 2 19 1 24 2 46 2 292 2 44 1 53 2 125 2 50 3 84 2 88 4 137
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

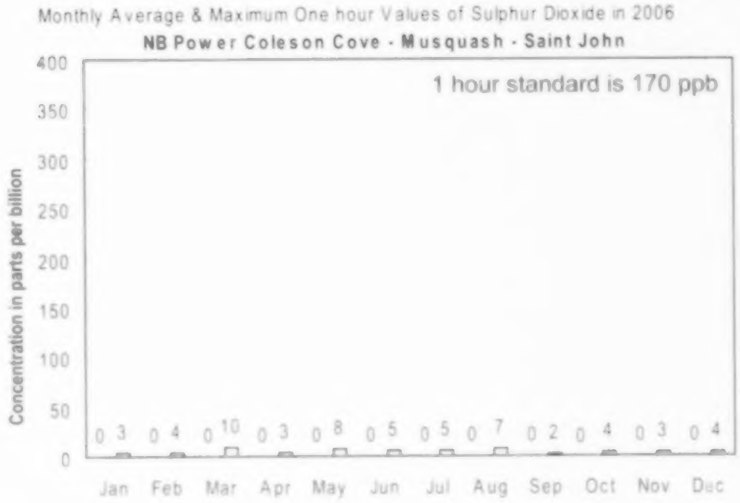

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
Grandview West 1 - Saint John
1 hour standard is 170 ppb
Concentration in parts per billion
332
748
517
781
354
585
350
111
146
195
165
182
9
5
11
20
1
1
5
3
7
8
7
5
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
Forest Products Irving - Saint John
1 hour standard is 170 ppb
Concentration in parts per billion
4
57
5
106
4
67
1
24
0
7
1
16
1
35
1
25
1
17
2
50
3
102
5
63
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

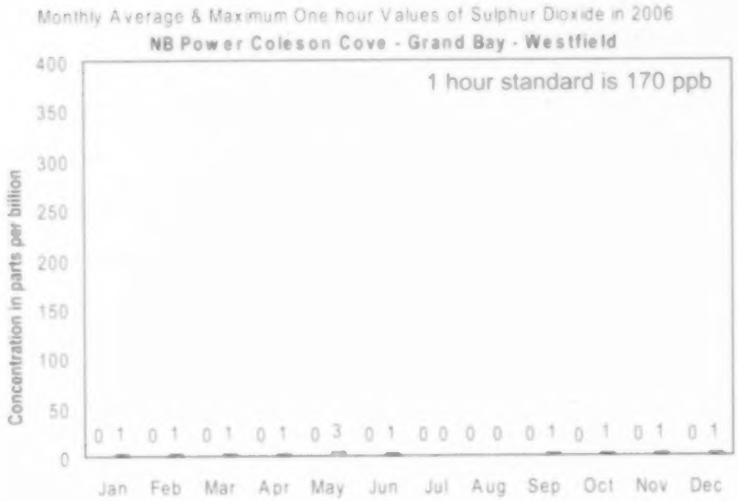

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
Silver Falls Irving - Saint John
1 hour standard is 170 ppb
Concentration in parts per billion
1
37
1
57
1
50
1
23
2
28
2
30
5
72
3
100
2
43
1
16
1
50
1
9
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

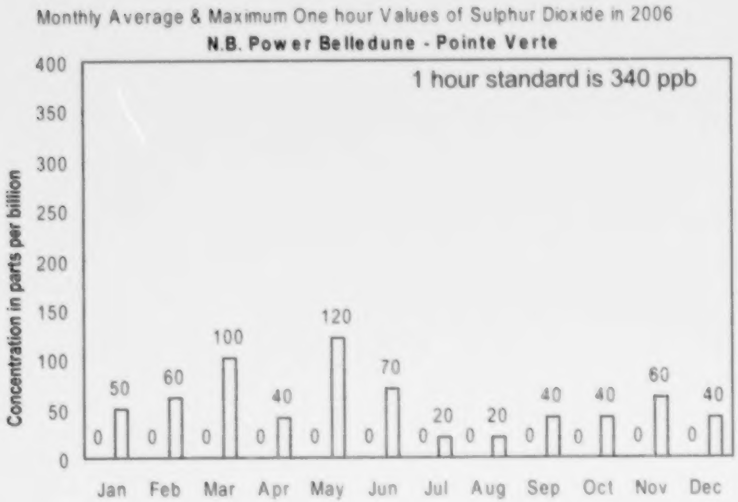

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
IOL - Midwood Avenue - Saint John
1 hour standard is 170 ppb
Concentration in parts per billion
3
87
3
68
4
256
7
371
0
23
0
14
0
48
1
26
1
38
1
38
3
48
4
41
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

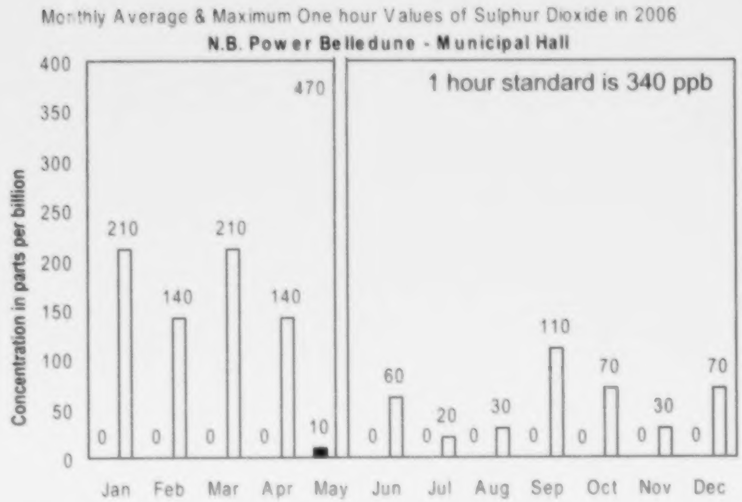

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
NB Power Coleson Cove - Lorneville Cemetery - Saint John
1 hour standard is 170 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

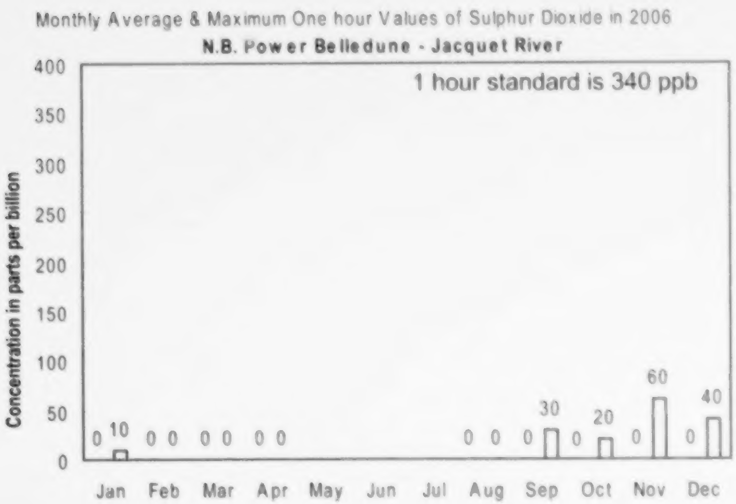

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
NB Power Coleson Cove - Musquash - Saint John
1 hour standard is 170 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

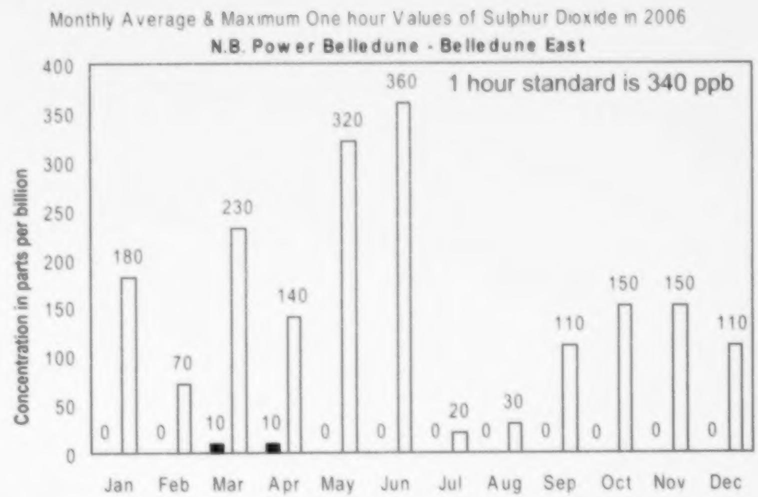

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
NB Power Coleson Cove - Manawagonish Road - Saint John
1 hour standard is 170 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

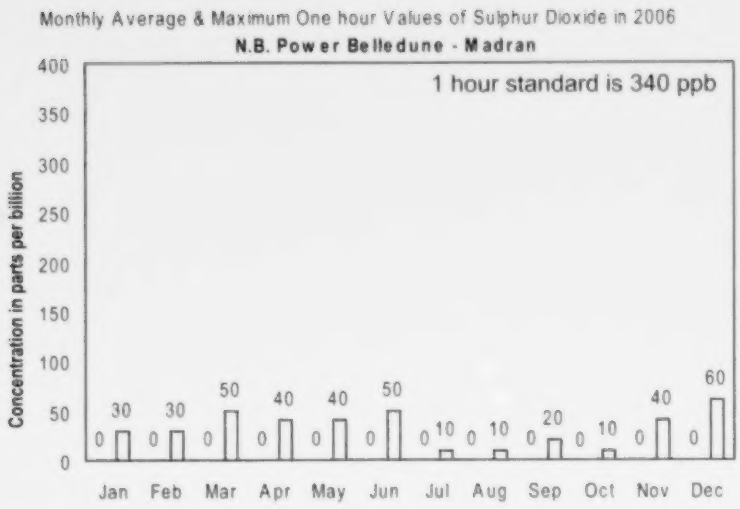

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
NB Power Coleson Cove - Grand Bay - Westfield
1 hour standard is 170 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

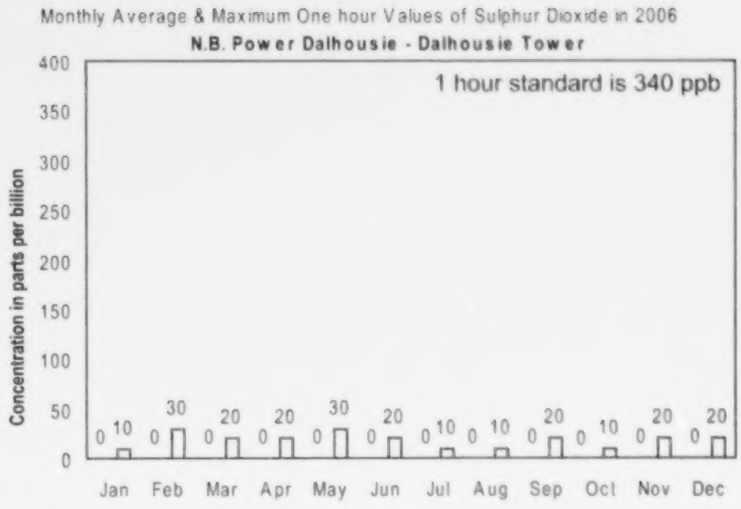

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
N.B. Power Belledune - Pointe Verte
1 hour standard is 340 ppb
Concentration in parts per billion
400
350
300
250
200
150
100
50
0
50
60
100
40
120
70
20
20
40
40
60
40
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

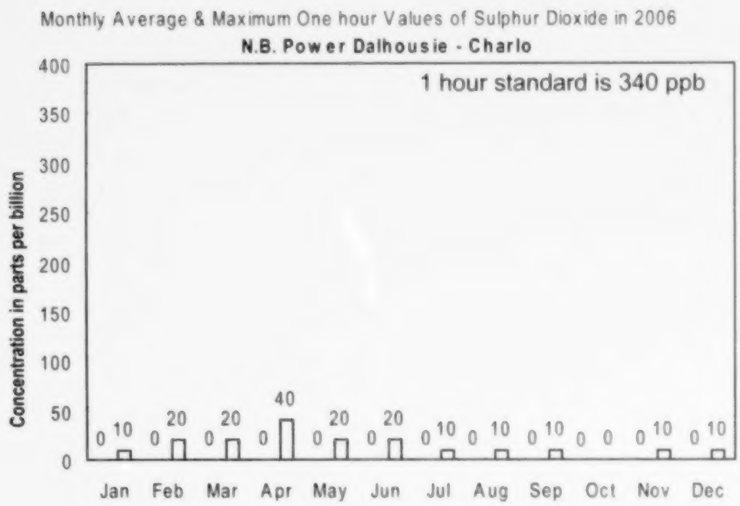

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
N.B. Power Belledune - Municipal Hall
1 hour standard is 340 ppb
Concentration in parts per billion
470
210
140
210
140
10
60
20
30
110
70
30
70
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

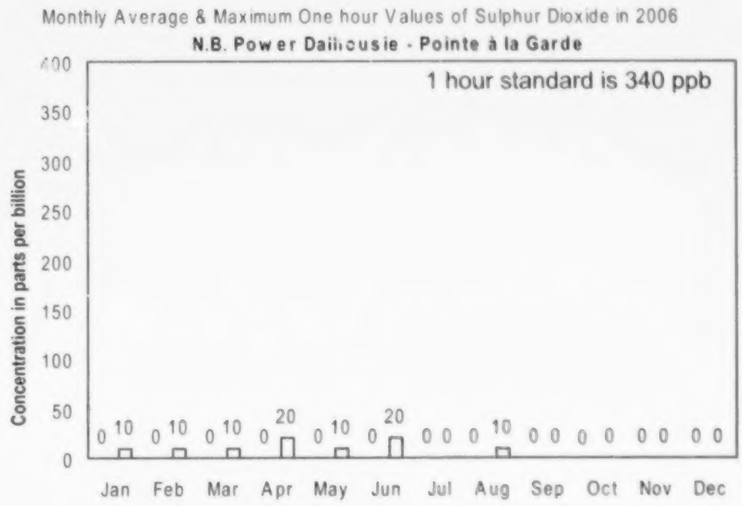

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
N.B. Power Belledune - Jacquet River
1 hour standard is 340 ppb
Concentration in parts per billion
10
30
20
60
40
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

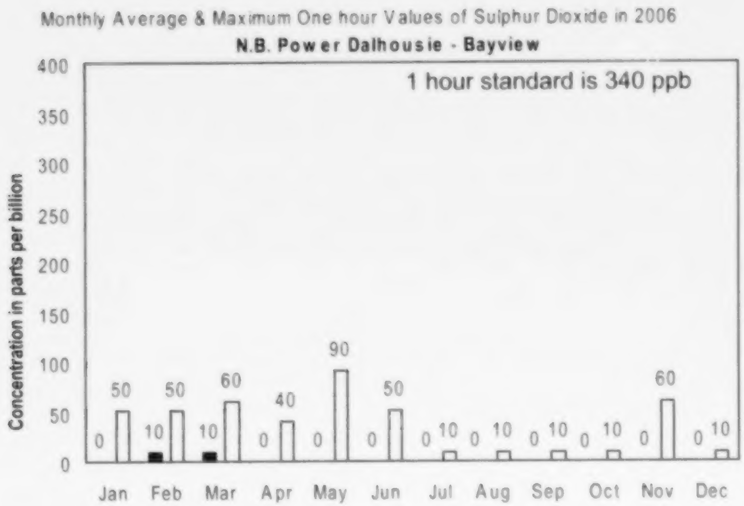

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
N.B. Power Belledune - Belledune East
1 hour standard is 340 ppb
Concentration in parts per billion
180
70
10
230
10
140
320
360
20
30
110
150
150
110
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

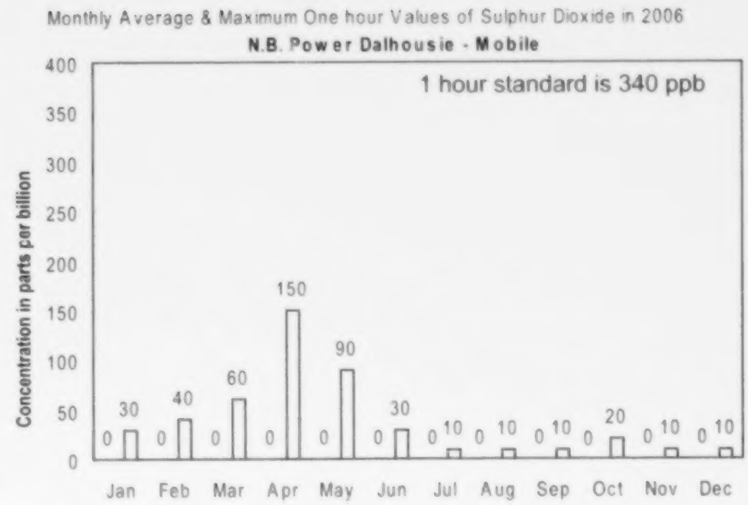

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
N.B. Power Belledune - Madran
1 hour standard is 340 ppb
Concentration in parts per billion
0 50 100 150 200 250 300 350 400
0 30 0 30 0 50 0 40 0 40 0 50 0 10 0 10 0 20 0 10 0 40 0 60
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

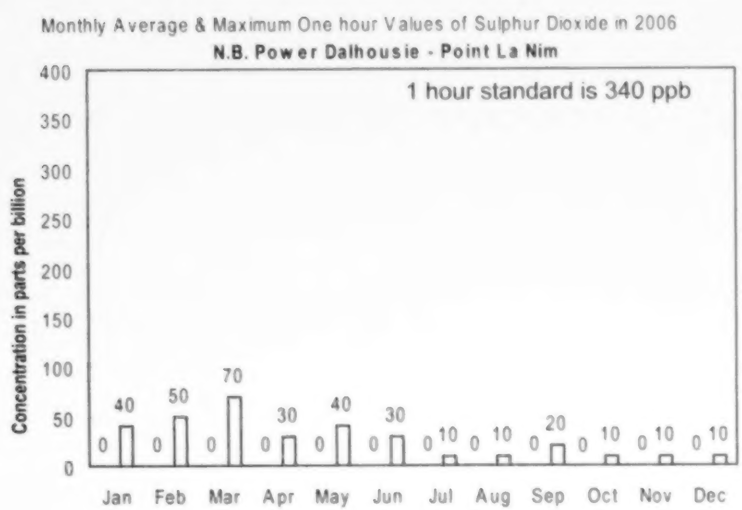

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
N.B. Power Dalhousie - Dalhousie Tower
1 hour standard is 340 ppb
Concentration in parts per billion
0 50 100 150 200 250 300 350 400
0 10 0 30 0 20 0 20 0 30 0 20 0 10 0 10 0 20 0 10 0 20 0 20
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

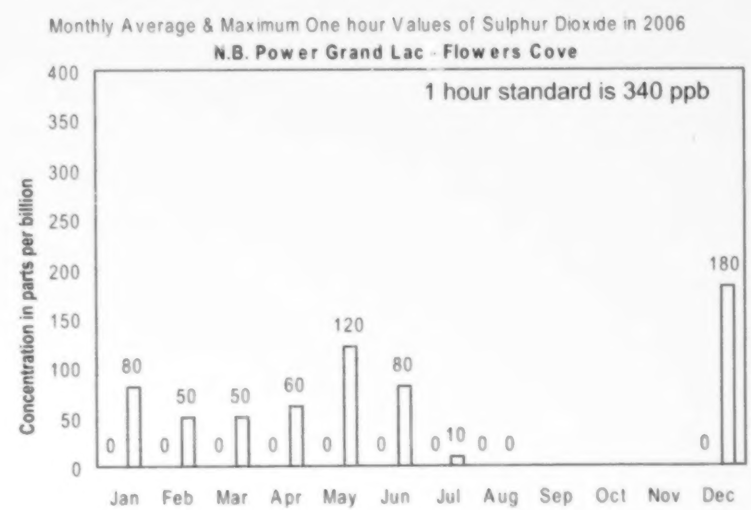

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
N.B. Power Dalhousie - Charlo
1 hour standard is 340 ppb
Concentration in parts per billion
0 50 100 150 200 250 300 350 400
0 10 0 20 0 20 0 40 0 20 0 20 0 10 0 10 0 10 0 0 0 10 0 10
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

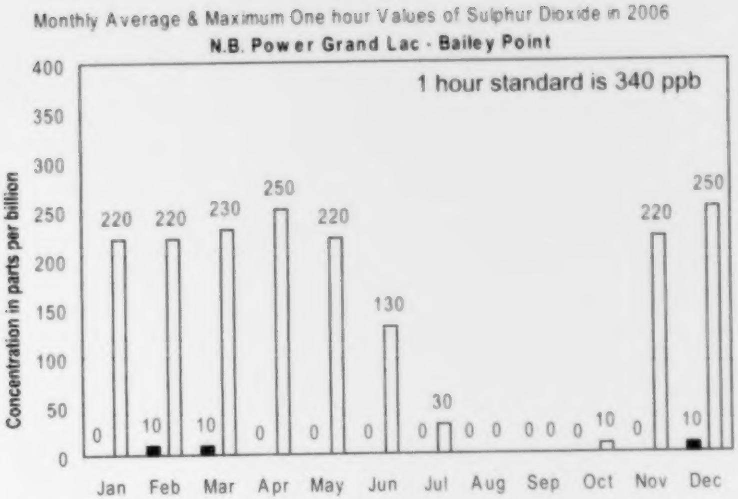

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
N.B. Power Dalhousie - Pointe à la Garde
1 hour standard is 340 ppb
Concentration in parts per billion
0 50 100 150 200 250 300 350 400
0 10 0 10 0 10 0 20 0 10 0 20 0 0 0 10 0 0 0 0 0 0 0 0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

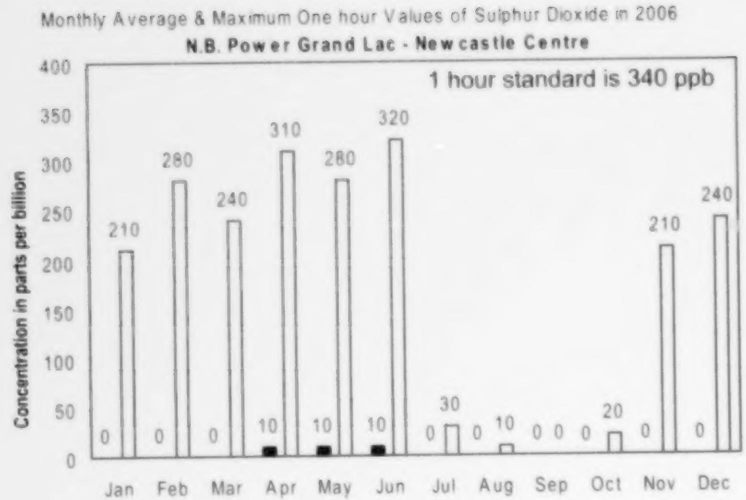

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
N.B. Power Dalhousie - Bayview
1 hour standard is 340 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

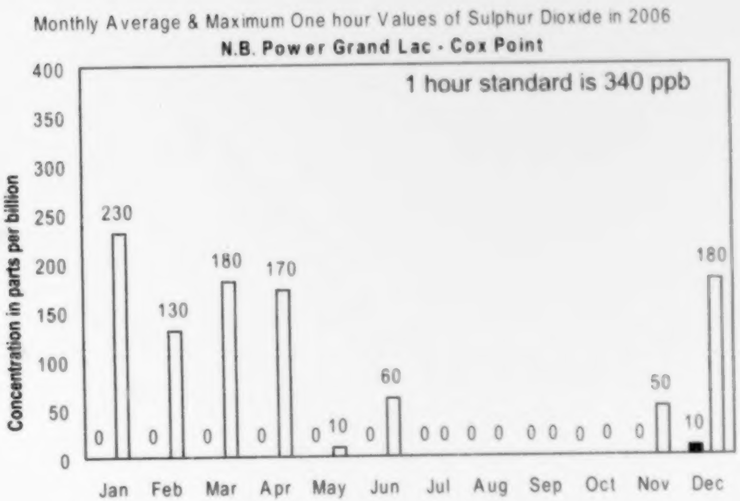

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
N.B. Power Dalhousie - Mobile
1 hour standard is 340 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

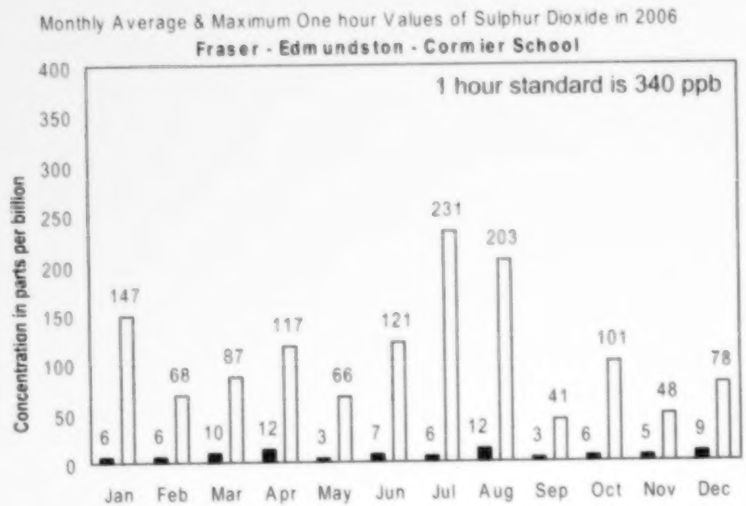

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
N.B. Power Dalhousie - Point La Nim
1 hour standard is 340 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

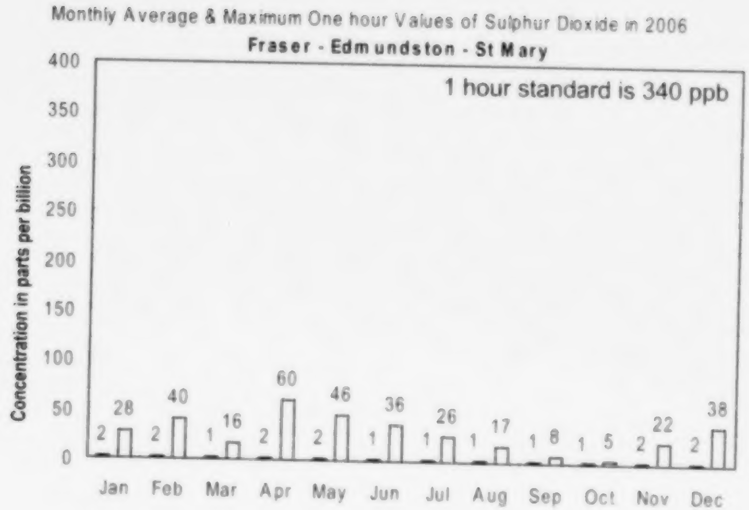

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
N.B. Power Grand Lac - Flowers Cove
1 hour standard is 340 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
N.B. Power Grand Lac - Bailey Point
1 hour standard is 340 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

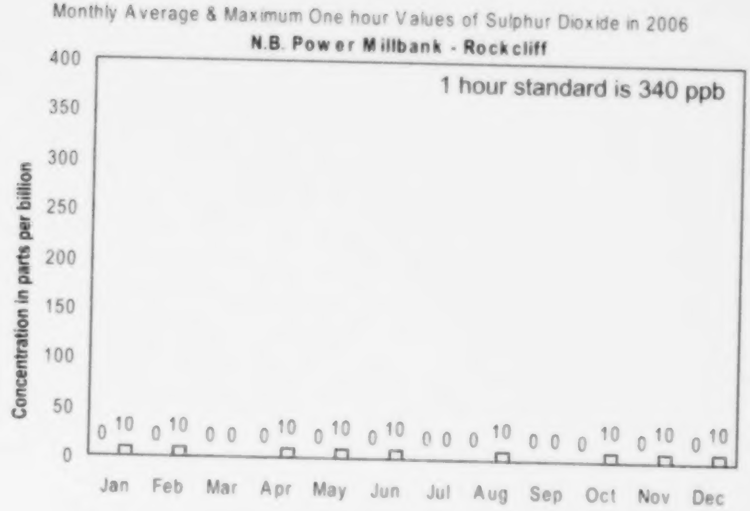

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
N.B. Power Grand Lac - Newcastle Centre
1 hour standard is 340 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
N.B. Power Grand Lac - Cox Point
1 hour standard is 340 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

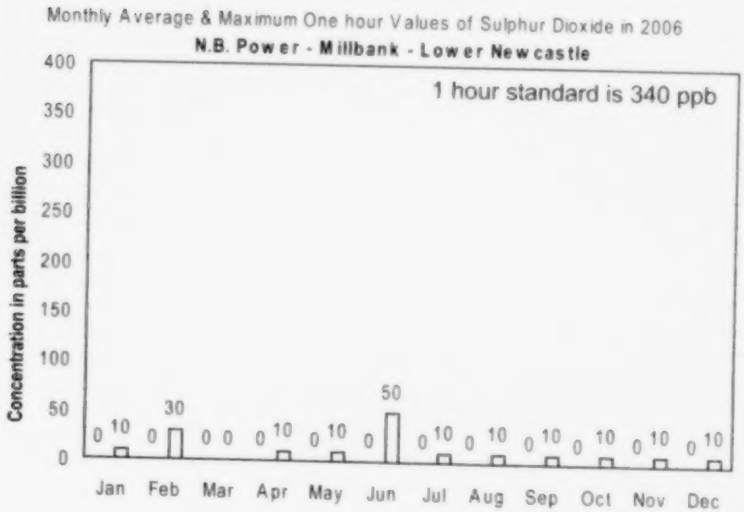

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
Fraser - Edmundston - Cormier School
1 hour standard is 340 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec



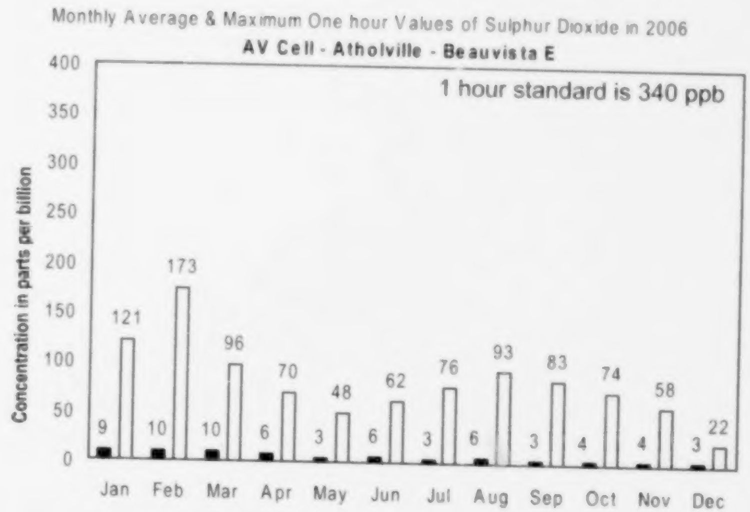
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
Fraser - Edmundston - St Mary
1 hour standard is 340 ppb
Concentration in parts per billion
2 28 2 40 1 16 2 60 2 46 1 36 1 26 1 17 1 8 1 5 2 22 2 38
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec



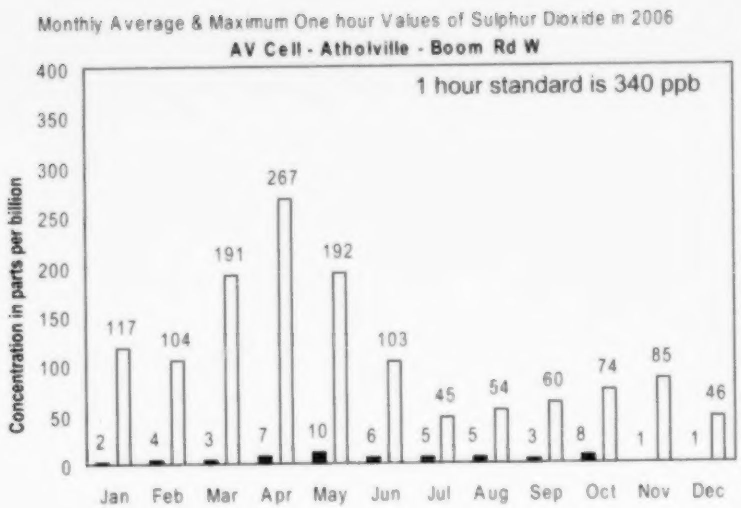
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
N.B. Power Millbank - Rockcliff
1 hour standard is 340 ppb
Concentration in parts per billion
0 10 0 10 0 0 0 10 0 10 0 10 0 0 0 10 0 0 0 10 0 10 0 10
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

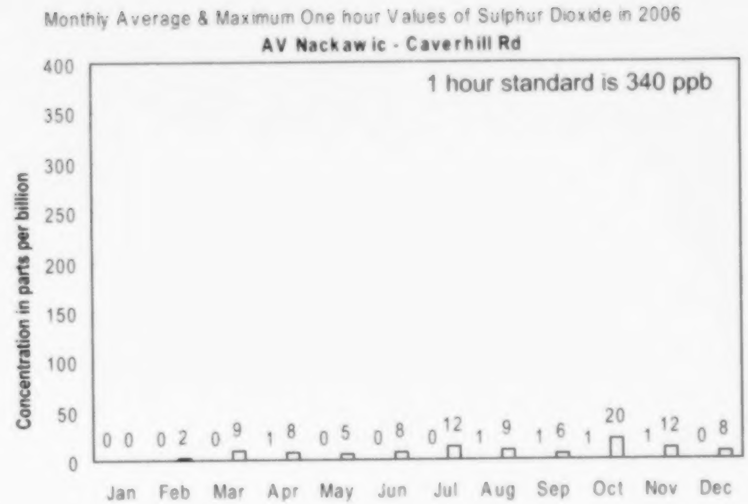


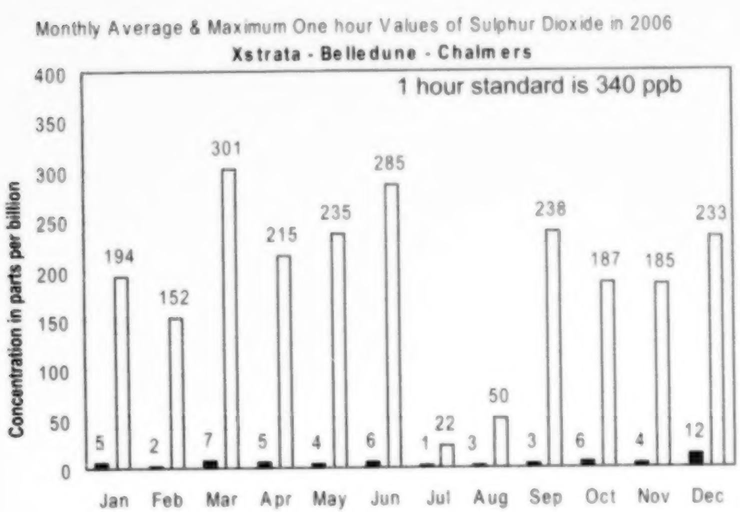
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
N.B. Power - Millbank - Lower Newcastle
1 hour standard is 340 ppb
Concentration in parts per billion
0 10 0 30 0 0 0 10 0 10 0 50 0 10 0 10 0 10 0 10 0 10 0 10
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

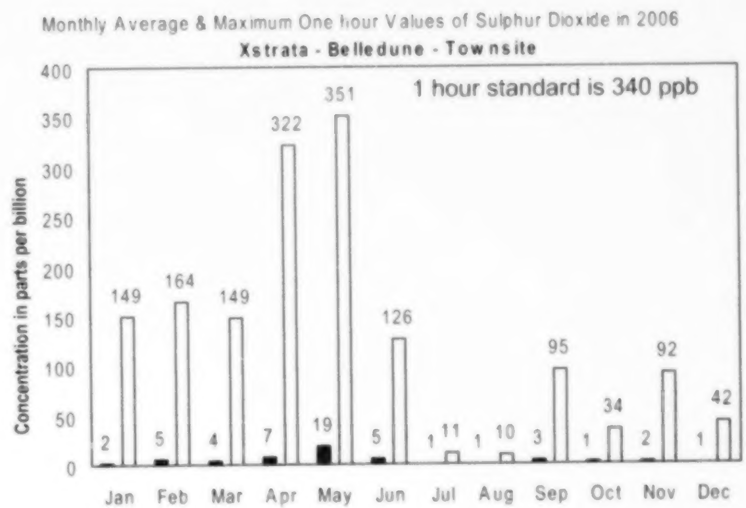


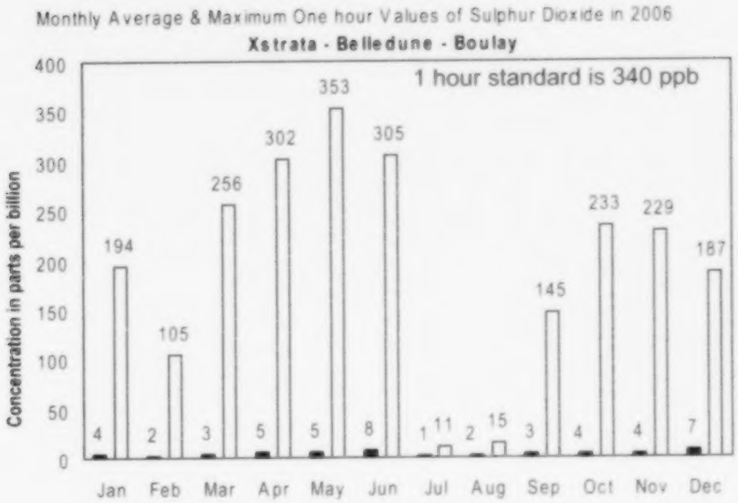
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
AV Cell - Atholville - Beauvista E
1 hour standard is 340 ppb
Concentration in parts per billion
9 121 10 173 10 96 6 70 3 48 6 62 3 76 6 93 3 83 4 74 4 58 3 22
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

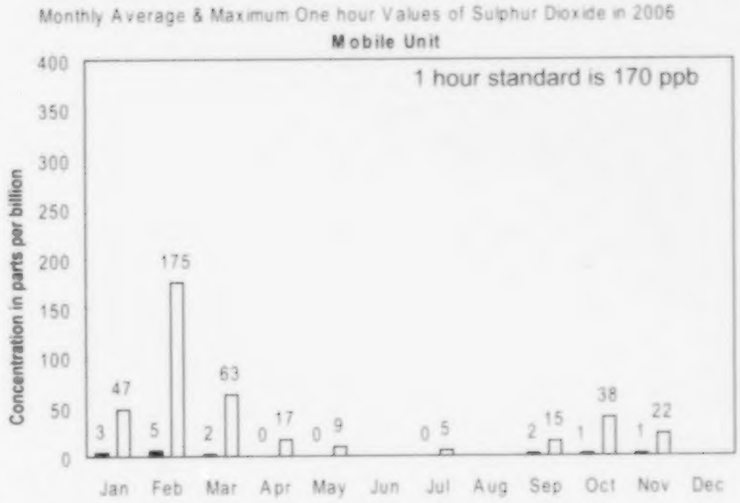

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
AV Cell - Atholville - Boom Rd W
1 hour standard is 340 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2 117 4 104 3 191 7 267 10 192 6 103 5 45 5 54 3 60 8 74 1 85 1 46

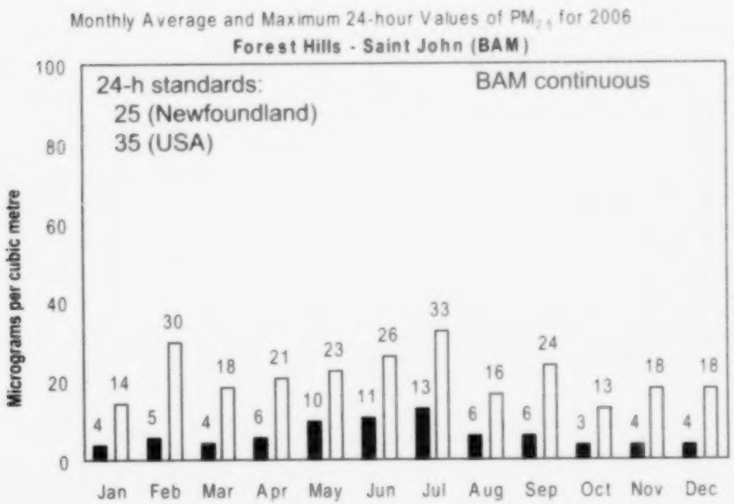

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
AV Nackawic - Caverhill Rd
1 hour standard is 340 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
0 0 0 2 0 9 1 8 0 5 0 8 0 12 1 9 1 6 1 20 1 12 0 8

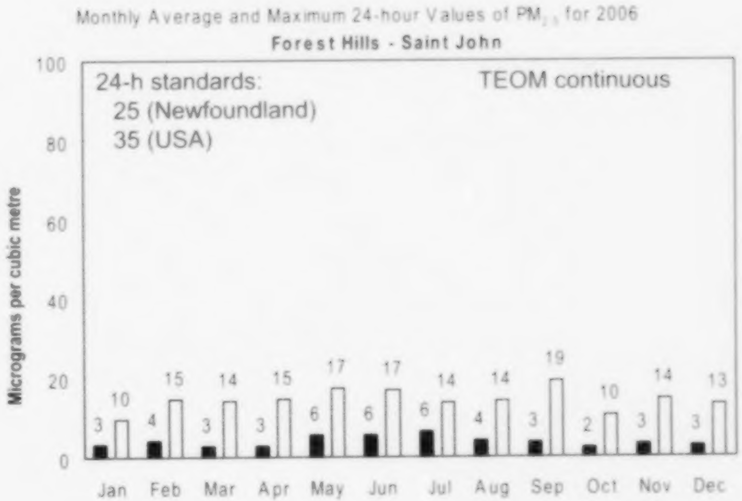

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
Xstrata - Belledune - Chalmers
1 hour standard is 340 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
5 194 2 152 7 301 5 215 4 235 6 285 1 22 3 50 3 238 6 187 4 185 12 233

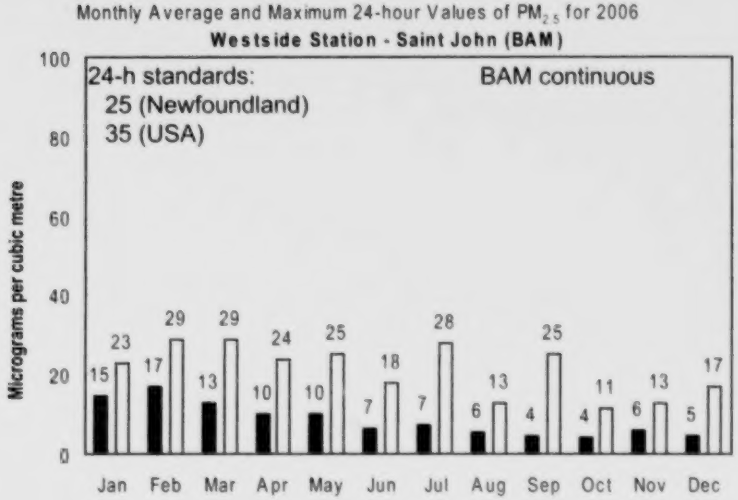

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
Xstrata - Belledune - Townsite
1 hour standard is 340 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2 149 5 164 4 149 7 322 19 351 5 126 1 11 1 10 3 95 1 34 2 92 1 42

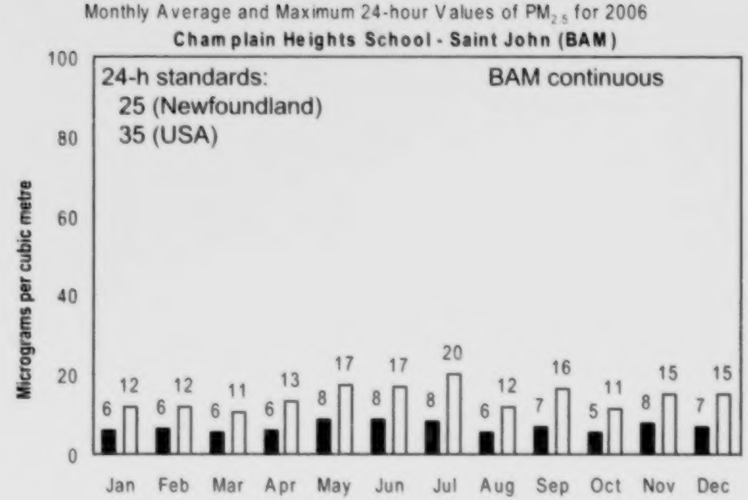

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
Xstrata - Belledune - Boulay
1 hour standard is 340 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4 194 2 105 3 256 5 302 5 353 8 305 1 11 2 15 3 145 4 233 4 229 7 187

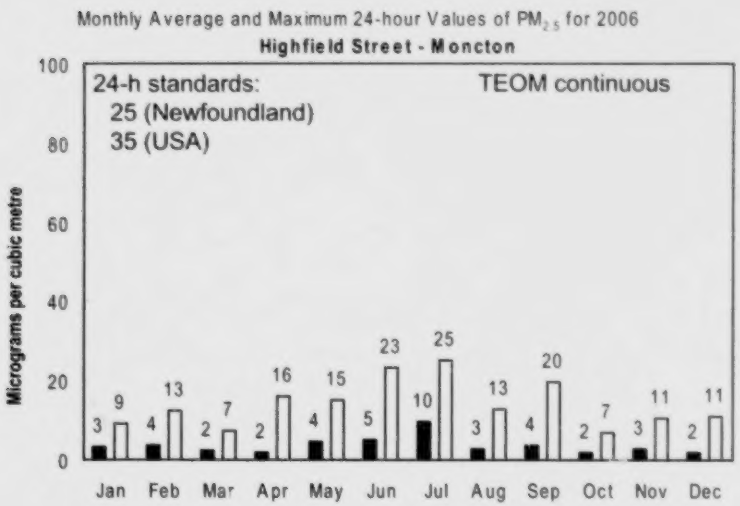

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2006
Mobile Unit
1 hour standard is 170 ppb
Concentration in parts per billion
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
3 47 5 175 2 63 0 17 0 9 0 5 2 15 1 38 1 22

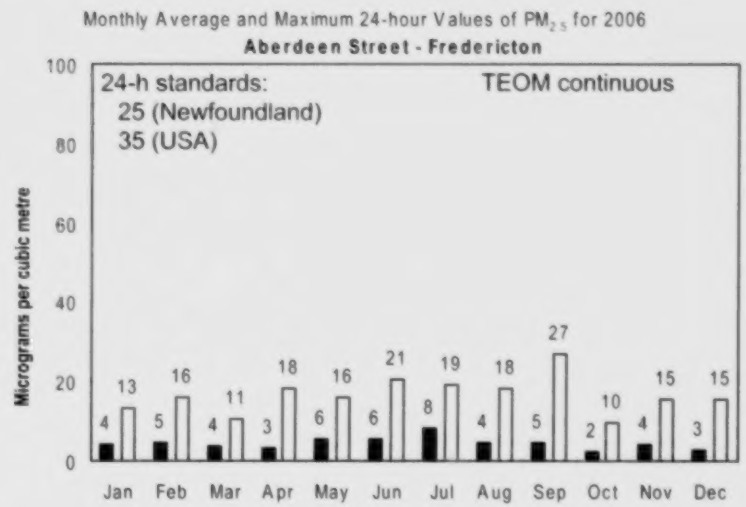

Monthly Average and Maximum 24-hour Values of PM2.5 for 2006
Forest Hills - Saint John (BAM)
24-h standards:
25 (Newfoundland)
35 (USA)
BAM continuous
Micrograms per cubic metre
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4 14 5 30 4 18 6 21 10 23 11 26 13 33 6 16 6 24 3 13 4 18 4 18

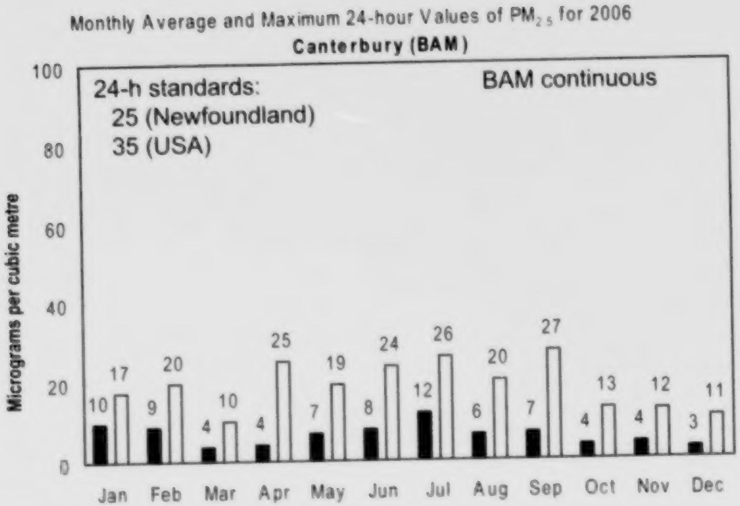

Monthly Average and Maximum 24-hour Values of PM2.5 for 2006
Forest Hills - Saint John
24-h standards:
25 (Newfoundland)
35 (USA)
TEOM continuous
Micrograms per cubic metre
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
3 10 4 15 3 14 3 15 6 17 6 17 6 14 4 14 3 19 2 10 3 14 3 13

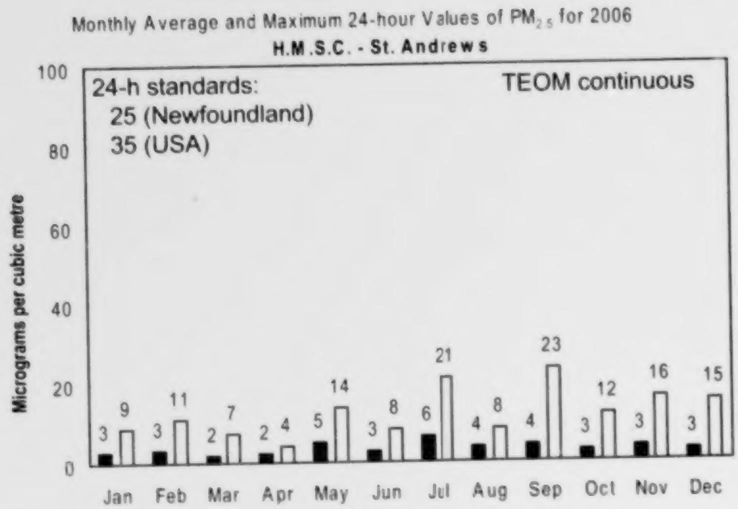

Monthly Average and Maximum 24-hour Values of PM2.5 for 2006
Westside Station - Saint John (BAM)
24-h standards:
25 (Newfoundland)
35 (USA)
BAM continuous
Micrograms per cubic metre
100
80
60
40
20
0
15 23
17 29
13 29
10 24
10 25
7 18
7 28
6 13
4 25
4 11
6 13
5 17
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

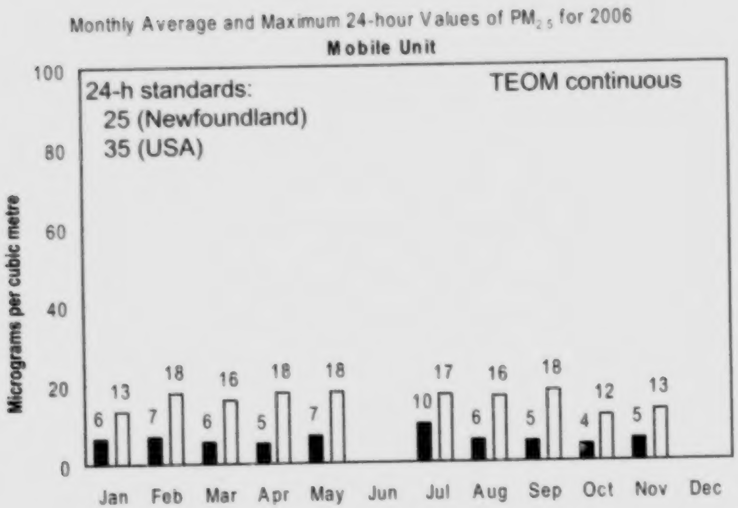

Monthly Average and Maximum 24-hour Values of PM2.5 for 2006
Champlain Heights School - Saint John (BAM)
24-h standards:
25 (Newfoundland)
35 (USA)
BAM continuous
Micrograms per cubic metre
100
80
60
40
20
0
6 12
6 12
6 11
6 13
8 17
8 17
8 20
6 12
7 16
5 11
8 15
7 15
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

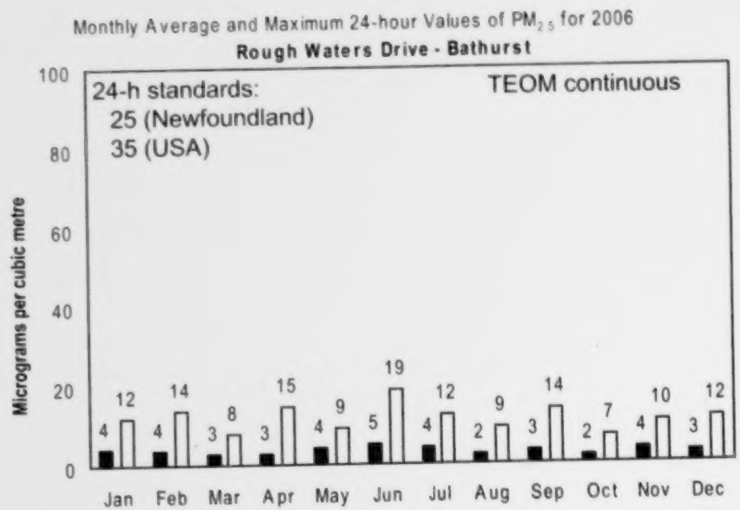

Monthly Average and Maximum 24-hour Values of PM2.5 for 2006
Highfield Street - Moncton
24-h standards:
25 (Newfoundland)
35 (USA)
TEOM continuous
Micrograms per cubic metre
100
80
60
40
20
0
3 9
4 13
2 7
2 16
4 15
5 23
10 25
3 13
4 20
2 7
3 11
2 11
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average and Maximum 24-hour Values of PM2.5 for 2006
Aberdeen Street - Fredericton
24-h standards:
25 (Newfoundland)
35 (USA)
TEOM continuous
Micrograms per cubic metre
100
80
60
40
20
0
4 13
5 16
4 11
3 18
6 16
6 21
8 19
4 18
5 27
2 10
4 15
3 15
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

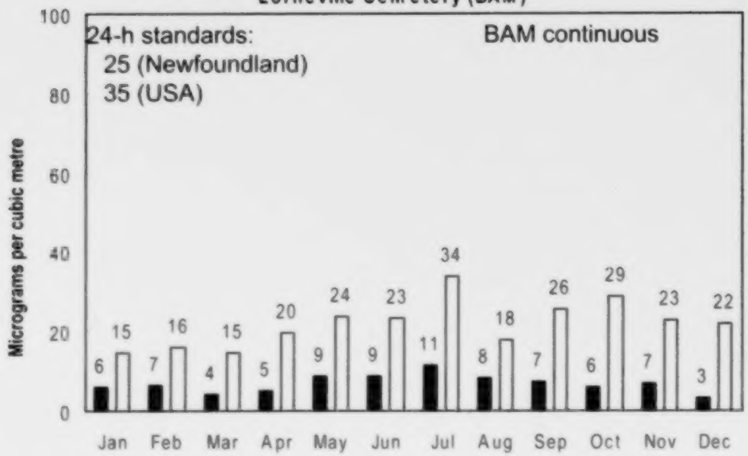

Monthly Average and Maximum 24-hour Values of PM2.5 for 2006
Canterbury (BAM)
24-h standards:
25 (Newfoundland)
35 (USA)
BAM continuous
Micrograms per cubic metre
10 17 9 20 4 10 4 25 7 19 8 24 12 26 6 20 7 27 4 13 4 12 3 11
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average and Maximum 24-hour Values of PM2.5 for 2006
H.M.S.C. - St. Andrews
24-h standards:
25 (Newfoundland)
35 (USA)
TEOM continuous
Micrograms per cubic metre
3 9 3 11 2 7 2 4 5 14 3 8 6 21 4 8 4 23 3 12 3 16 3 15
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

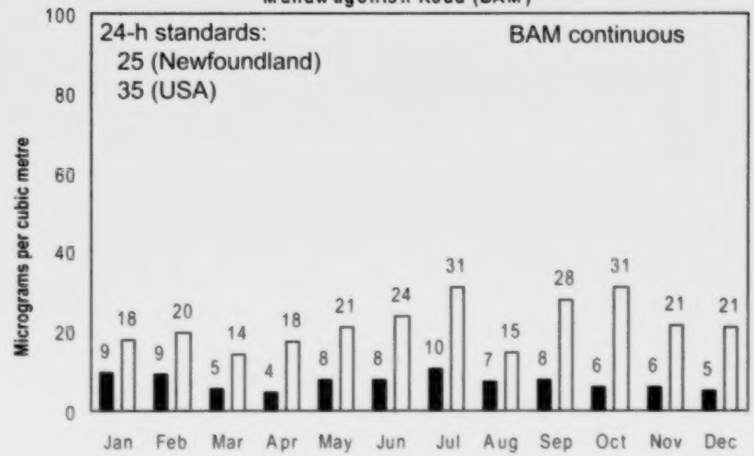

Monthly Average and Maximum 24-hour Values of PM2.5 for 2006
Mobile Unit
24-h standards:
25 (Newfoundland)
35 (USA)
TEOM continuous
Micrograms per cubic metre
6 13 7 18 6 16 5 18 7 18 10 17 6 16 5 18 4 12 5 13
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average and Maximum 24-hour Values of PM2.5 for 2006
Rough Waters Drive - Bathurst
24-h standards:
25 (Newfoundland)
35 (USA)
TEOM continuous
Micrograms per cubic metre
4 12 4 14 3 8 3 15 4 9 5 19 4 12 2 9 3 14 2 7 4 10 3 12
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2006
Lorneville Cemetery (BAM)

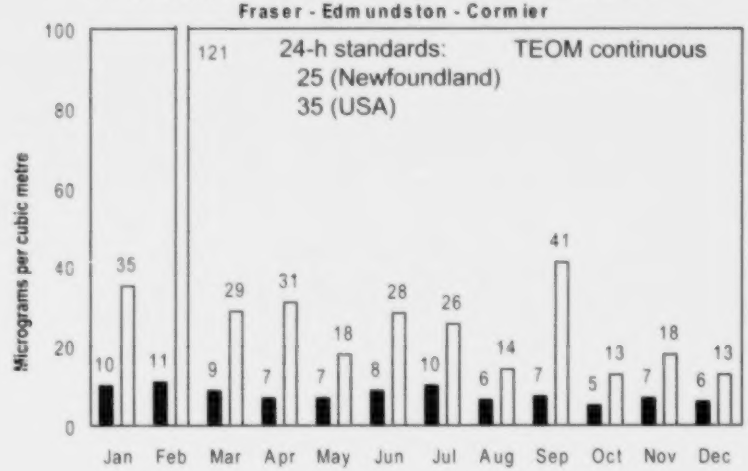


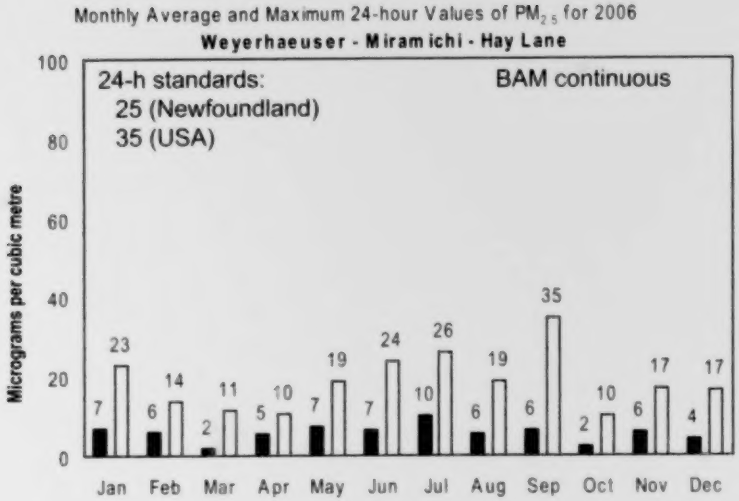
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2006
Manawagonish Road (BAM)



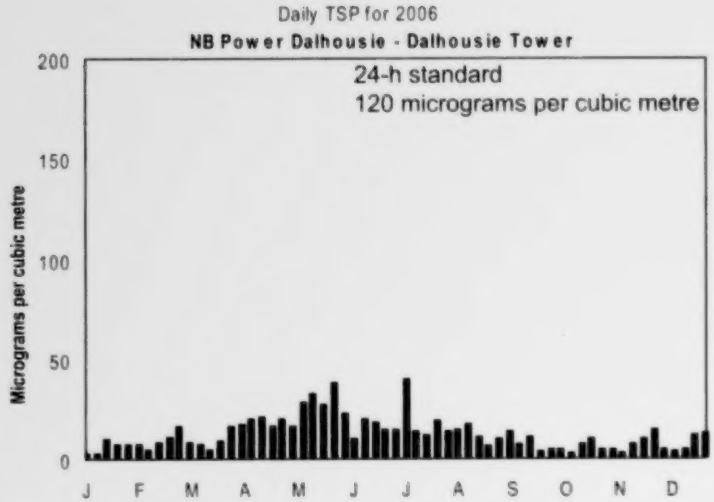
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2006
Weyerhaeuser - Miramichi - Fire Ponds

Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2006
Fraser - Edmundston - Cormier

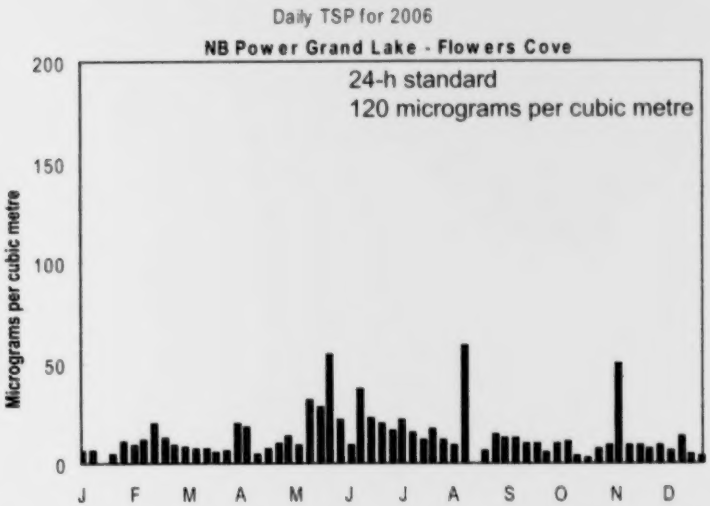




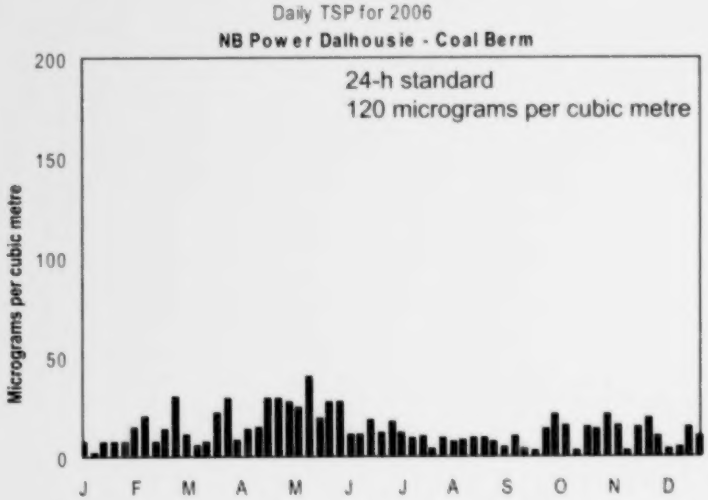
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2006
Weyerhaeuser - Miramichi - Hay Lane
24-h standards:
25 (Newfoundland)
35 (USA)
BAM continuous
Micrograms per cubic metre
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec



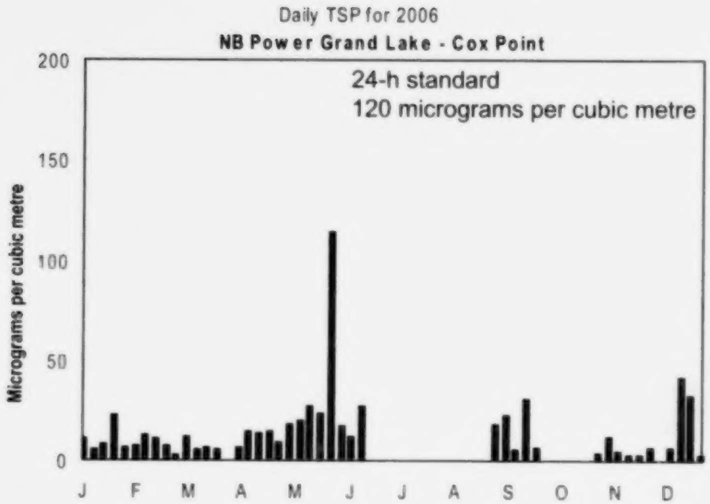
Daily TSP for 2006
NB Power Dalhousie - Dalhousie Tower
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
J F M A M J J A S O N D

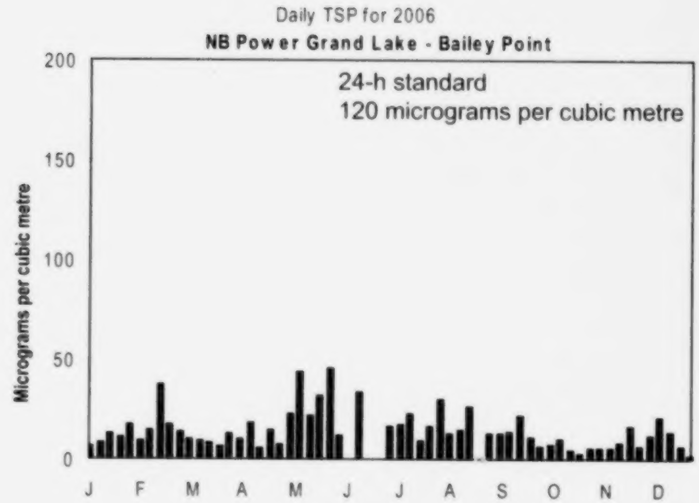


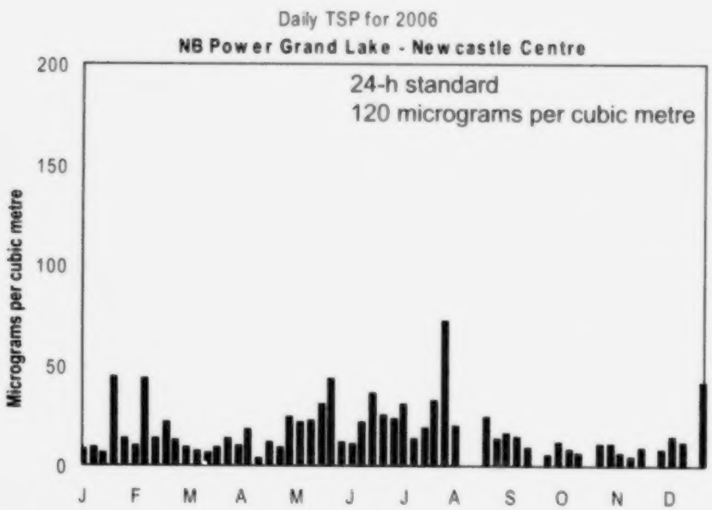
Daily TSP for 2006
NB Power Grand Lake - Flowers Cove
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
J F M A M J J A S O N D

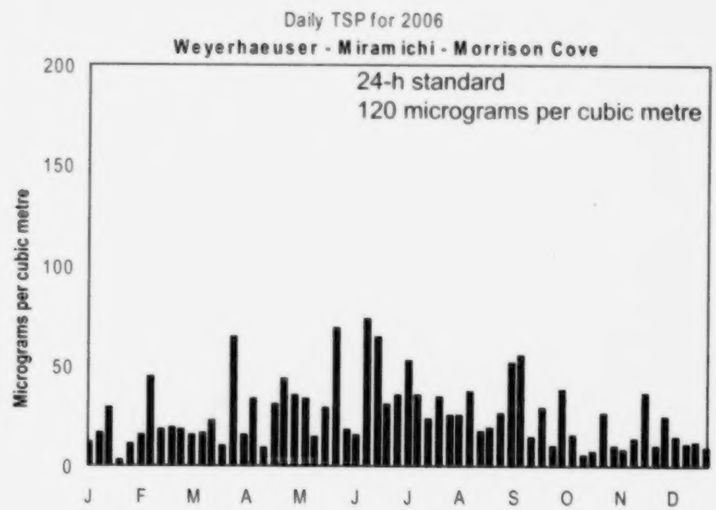


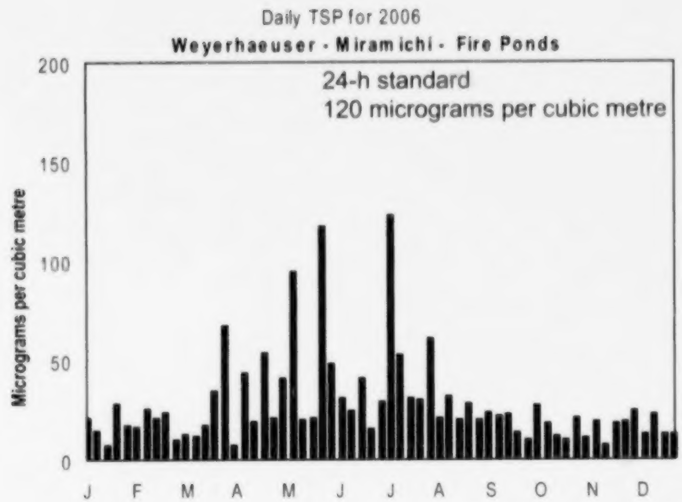
Daily TSP for 2006
NB Power Dalhousie - Coal Berm
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
J F M A M J J A S O N D

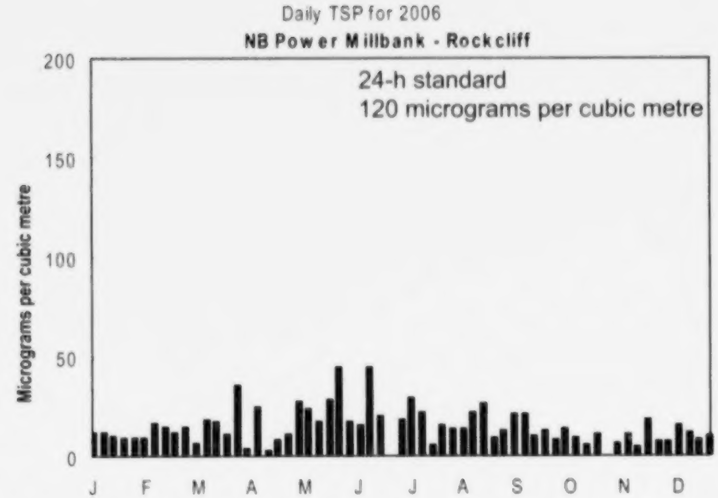

Daily TSP for 2006
NB Power Grand Lake - Cox Point
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J
F
M
A
M
J
J
A
S
O
N
D

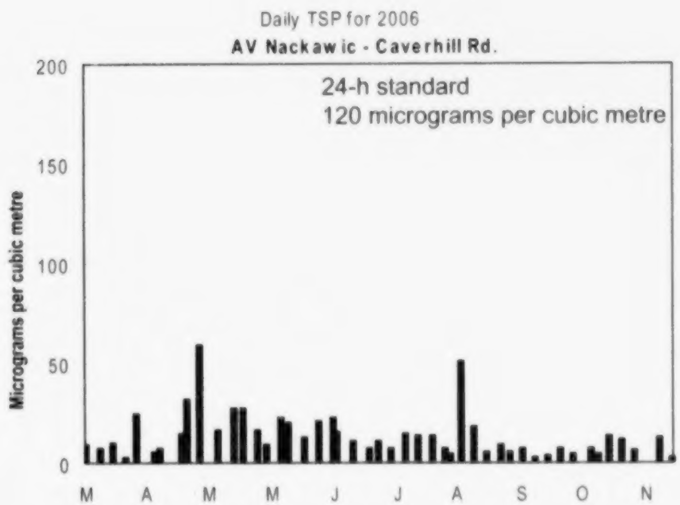

Daily TSP for 2006
NB Power Grand Lake - Bailey Point
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J
F
M
A
M
J
J
A
S
O
N
D

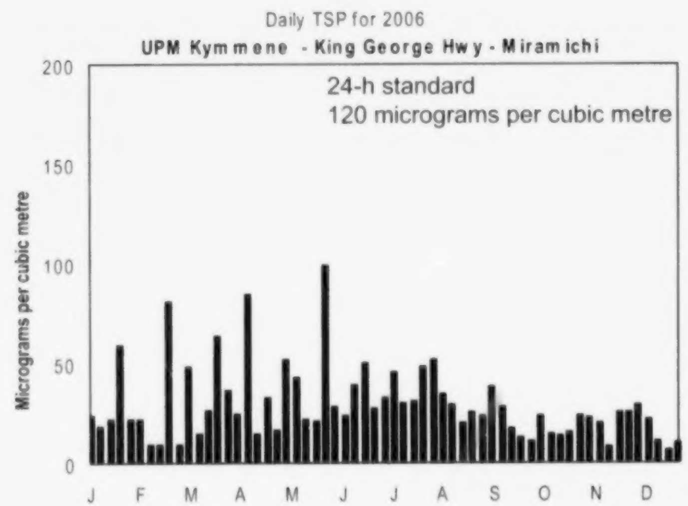

Daily TSP for 2006
NB Power Grand Lake - Newcastle Centre
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J
F
M
A
M
J
J
A
S
O
N
D

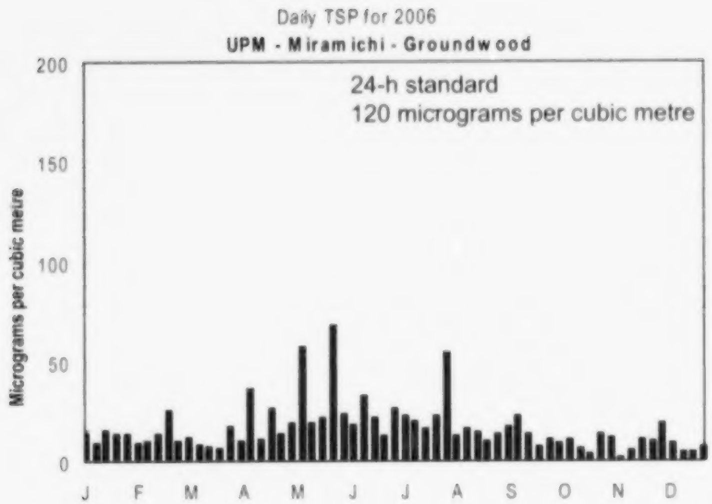

Daily TSP for 2006
Weyerhaeuser - Miramichi - Morrison Cove
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J
F
M
A
M
J
J
A
S
O
N
D

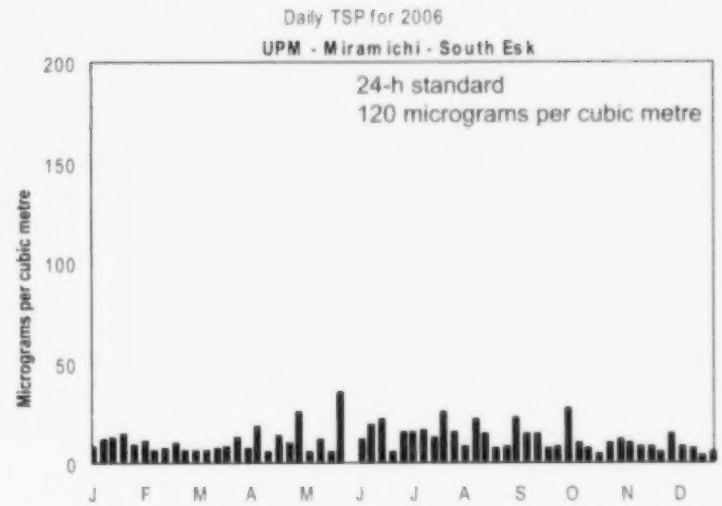

Daily TSP for 2006
Weyerhaeuser - Miramichi - Fire Ponds
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
0
50
100
150
200
J F M A M J J A S O N D

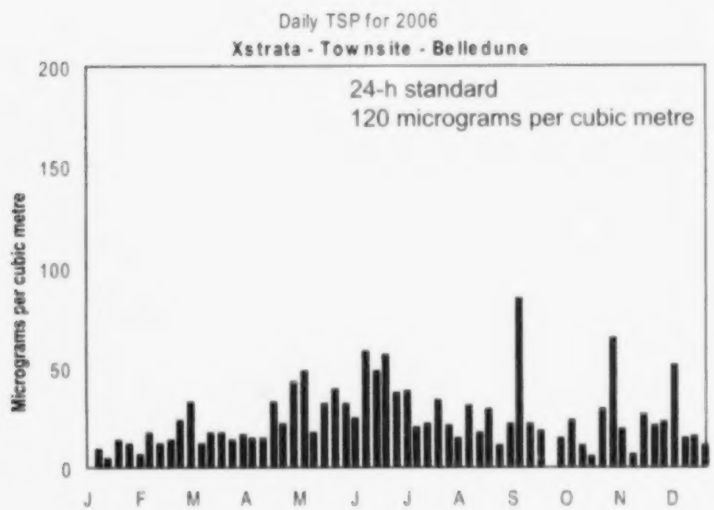

Daily TSP for 2006
NB Power Millbank - Rockcliff
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
0
50
100
150
200
J F M A M J J A S O N D

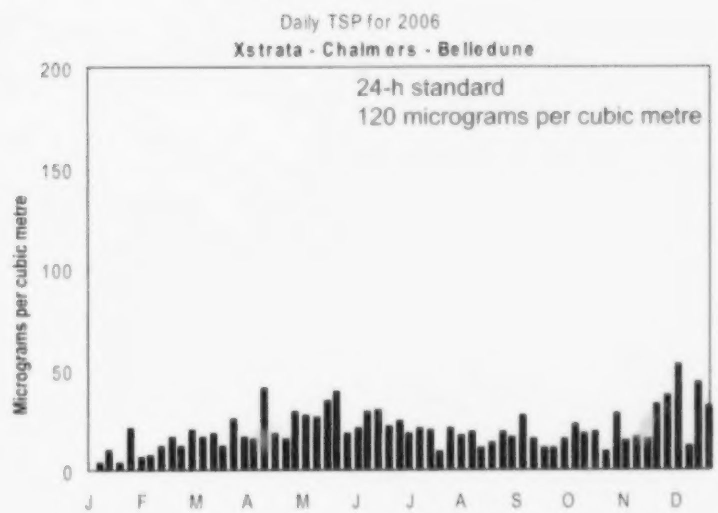

Daily TSP for 2006
AV Nackawic - Caverhill Rd.
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
0
50
100
150
200
M A M M J J A S O N

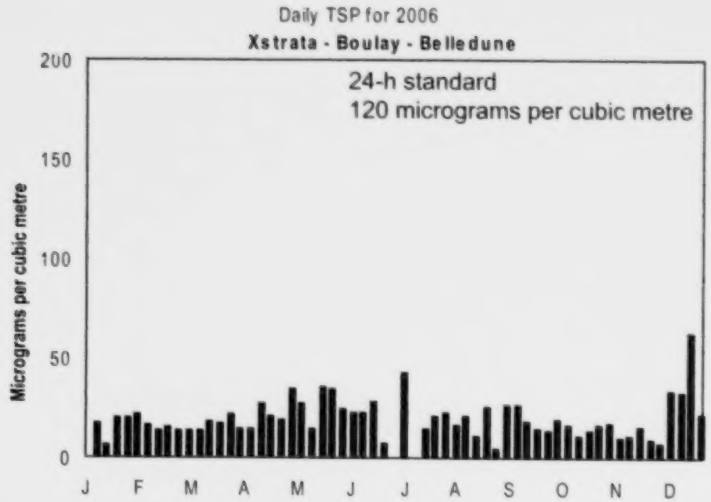

Daily TSP for 2006
UPM Kymmene - King George Hwy - Miramichi
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
0
50
100
150
200
J F M A M J J A S O N D

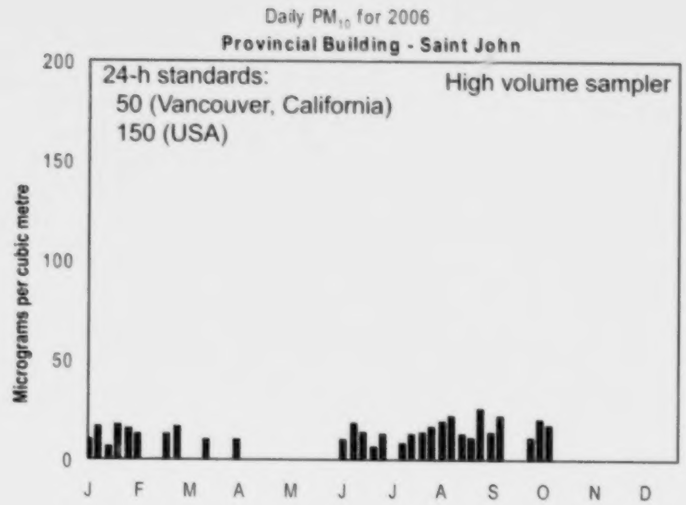

Daily TSP for 2006
UPM - Miramichi - Groundwood
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D


Daily TSP for 2006
UPM - Miramichi - South Esk
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D


Daily TSP for 2006
Xstrata - Townsite - Belledune
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D


Daily TSP for 2006
Xstrata - Chalmers - Belledune
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D


Daily TSP for 2006
Xstrata - Boulay - Belledune
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D


Daily PM_{10} for 2006
Provincial Building - Saint John
24-h standards:
50 (Vancouver, California)
150 (USA)
High volume sampler
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D

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